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REGIONAL AIRPORT SYSTEMS STUDY

FINAL PLAN RECOMMENDATION

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REGIONAL AIRPORT SYSTEMS STUDY

FINAL PLAN RECOMMENDATION

Presented by the Regional Airport Systems Study Committee:

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Contra Costa County
Chairman of the Committee

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Vice-Chairman of the Committee

Supervisor John McInnis
Marin County

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Solano County

Supervisor Marshall Sears
Napa County

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Sonoma County

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June 1972

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FOREWORD

This report was prepared for the Regional Airport Systems Study Committee by Walter E. Gillfillan, Project Coordinator, and by Association of Bay Area Governments staff members Connie Bastian, Nancy Jerrick, Paul Spiegel, and Ross Turner.

Chapter I presents the Committee's recommendation for a regional airport system. This will be incorporated into ABAG's Regional Plan 1970:90 as its aviation plan element upon approval by the ABAG Executive Committee.

Chapters II through VII provide the reader with an overview of the study elements. They include the alternatives considered, the working papers of the Committee, the input from citizens and organizations, and the goal, policies, and decision criteria used in making the decision. Implementation of the plan is discussed in Chapter VIII.

Certain assumptions and data which appear in Chapter III were revised later in the study, many of them in accordance with the revision by the Committee of the initial aviation forecast used in the technical reports. The adopted decision criteria in Chapter IV contain the new assumptions made by the Committee. Chapter I and the appendices present key data which includes any modifications of the original work and which can be used by the reader as a technical summary and reference.

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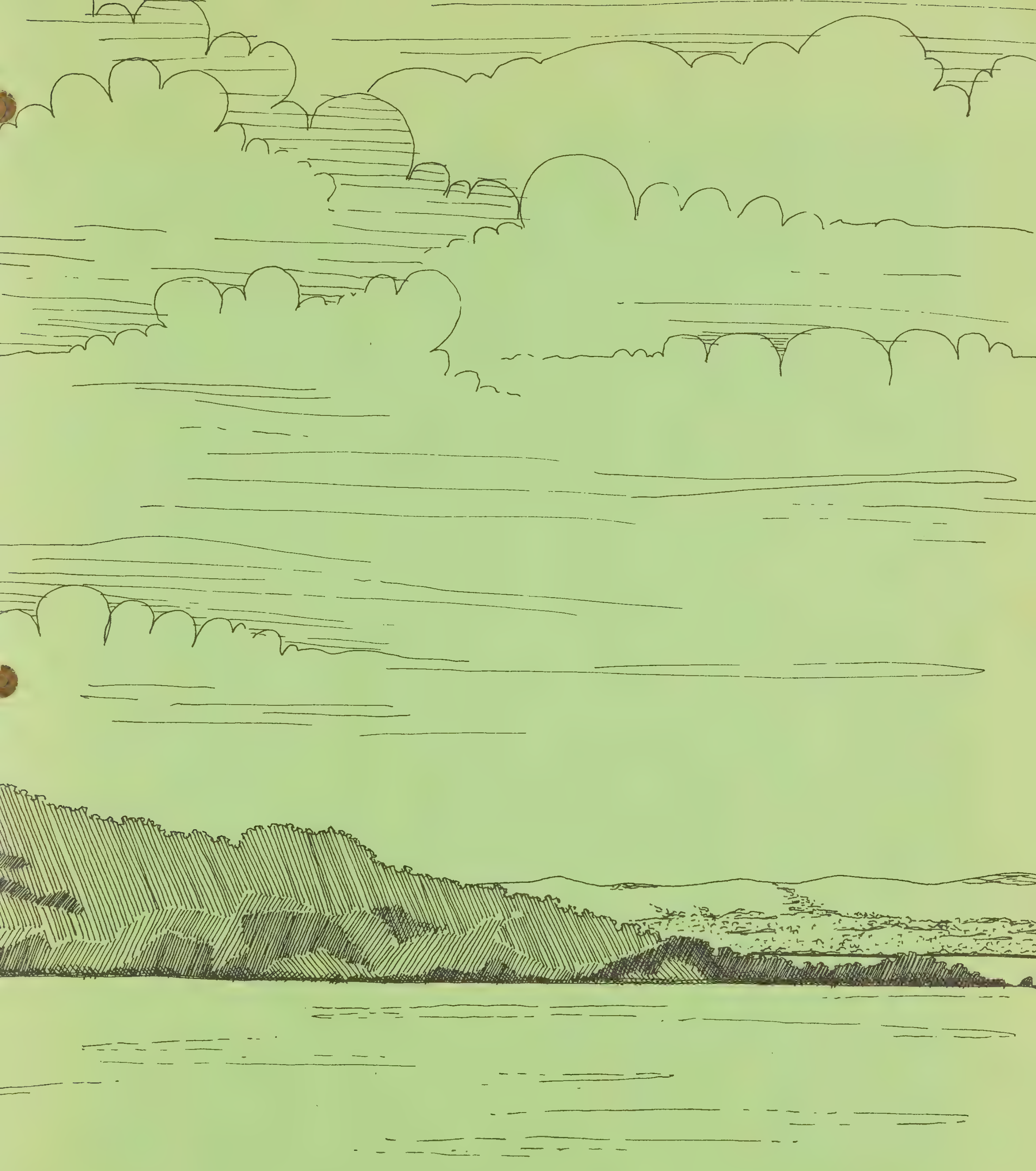

I-The Recommendation

CHAPTER I

THE RECOMMENDATION

Airline Airports (see Figure 1)

- San Francisco Airport (SFO) growth continues to a maximum of about 31 million annual passengers (MAP) by 1985.

- Oakland Airport (OAK) begins to assume an increasingly larger role as a regional airport, reaching about 24 MAP by 1985.

- San Jose Airport (SJC), limited by its environmental impact on the community, diverts passengers to SFO and OAK after reaching its approximate environmental capacity of 10 MAP in 1985.

- Hamilton Air Force Base (joint civil/military use) or Napa County Airport are identified as North Bay service points for California Corridor traffic and are limited at the request of the sponsoring counties to 1 MAP by 1985.

- Travis Air Force Base (joint civil/military use) is identified at 6 MAP by 1985 to begin to serve the market areas of Solano, Napa, and parts of Contra Costa Counties. It also has the potential of serving a broader regional need in the future.

Military Airports

- The existing military airports are assumed to continue military operation at present levels through 1985. The recommended plan for civil aviation does not infringe on the military requirements.

General Aviation Airports (see Figure 2)

- 11 existing general aviation airports will be vital to the Region and will serve a large number of users throughout the Region:

  Oakland North Airport
  Hayward Air Terminal
  Buchanan Field
  Livermore Municipal

San Carlos Airport
Gnoss Field
Reid-Hillview Airport
San Jose Municipal
Palo Alto Airport
Napa County Airport
Half Moon Bay Airport

- With the possible loss of 8 privately owned airports between now and 1985, 11 new general aviation airports will be needed to serve the Region as replacements and to provide facilities for the projected growth. This would mean new airports by 1985 in:

Alameda County	1
Contra Costa County	2
Napa County	1
San Mateo County	1
Santa Clara County	4*
Solano County	1
Sonoma County	1

This is the regional plan for the nine Bay Area counties. It is not intended to prevent development of a local airport for local purposes unless such development would interfere with other airports in this plan. In the Committee's judgment, it best fits the decision criteria and reflects the priorities among conflicting issues.

The Reasons for the Plan Selection

What follows is a description of the individual subject areas that the Regional Airport Systems Study Committee dealt with. It is a compendium of the technical reports prepared by contractors for the Committee, of the technical material submitted by other agencies, of opinion expressed at the public hearings, of staff briefings, and finally of the consensus reached by the Committee.

While attention is directed to the 1985 portion of the plan, the Committee has reviewed and identified the intermediate steps through 1975 and 1980 to allow an achievable path to 1985. The decision criteria used as a basis for the choice of airports are spelled out. Several of these criteria act as conditions which must be met by the chosen alternative, noise being a significant example.

The remainder of this chapter presents details of the plan. The appendices supplement the text in providing technical materials used by the Committee, including any revisions made during the course of the study. While the individual elements are dealt with separately here, the Committee had to consider all of them together when evaluating the alternatives and making the final choice.

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* South County Airport now under construction.

Figure 1

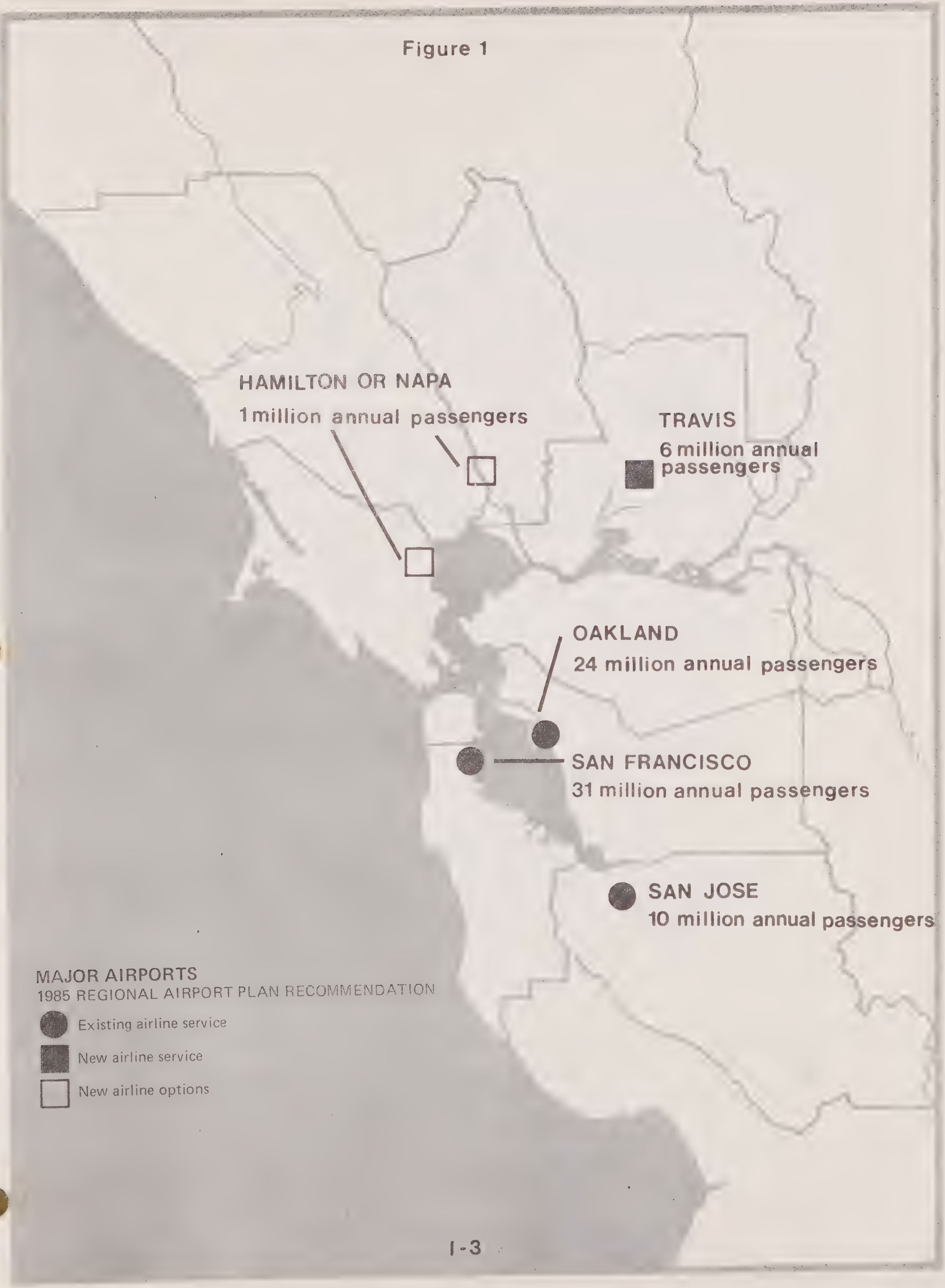
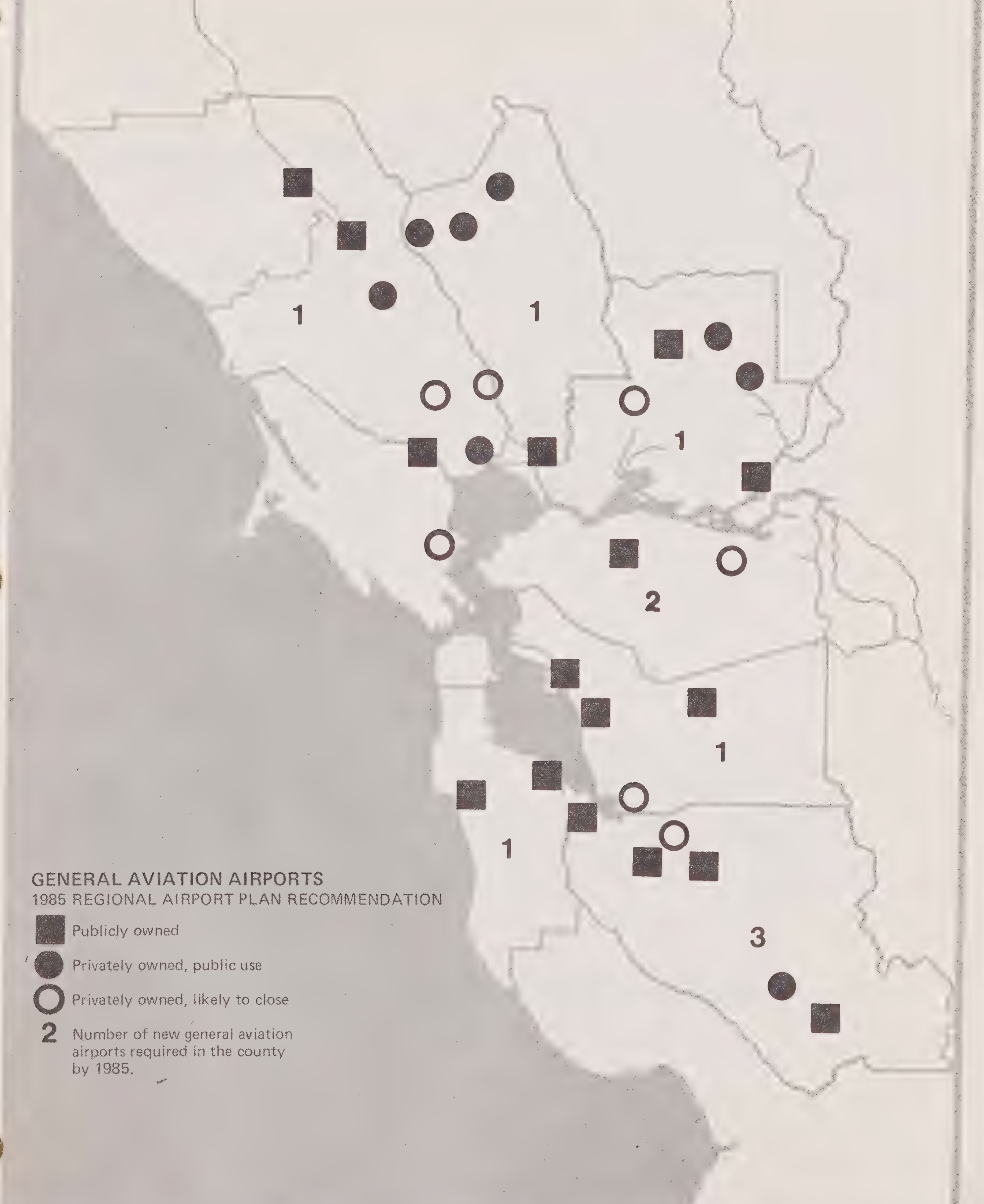

HAMILTON OR NAPA
1 million annual passengers
TRAVIS
6 million annual passengers
OAKLAND
24 million annual passengers
SAN FRANCISCO
31 million annual passengers
SAN JOSE
10 million annual passengers
MAJOR AIRPORTS
1985 REGIONAL AIRPORT PLAN RECOMMENDATION
Existing airline service
New airline service
New airline options

Figure 2


GENERAL AVIATION AIRPORTS
1985 REGIONAL AIRPORT PLAN RECOMMENDATION
Publicly owned
Privately owned, public use
Privately owned, likely to close
2 Number of new general aviation airports required in the county by 1985.
1
1
1
2
1
1
3

Forecast

Passengers: The forecasting was based on a historical relationship between population, income, and employment and the generation of local and visiting air passengers for the Bay Region. (A description of this process is included in Chapter III.)

The original forecast made in 1969 utilized the projections for population and employment from the Bay Area Transportation Study Commission together with income forecasts made by the contractor. That resulted in a projection of 83 MAP for the Bay Area by 1985.

Subsequent data from the 1970 Federal census together with many comments at the public hearings caused the Committee to ask the General Assembly of ABAG for a reevaluation of the BATSC projections used in ABAG's Regional Plan 1970:90. As that reevaluation would take some time, the Committee adopted as an interim projection the revised California Department of Finance population figures for the nine-county Region. Holding the per capita income and employment unchanged, the passenger projections were recalculated to produce:

	Forecast (millions of annual passengers)	
	Original	Revised
1975	31	28
1980	51	44
1985	83	72

Further detail is shown in Appendix B.

While these passenger projections include factors to reflect the economic recession of 1969-71, the forecast growth rates nevertheless show a broader use of air transportation by more people. The Air Transport Association, using a different evaluation of the effects of the recession, revised their projections downward to 59 MAP by 1985.* The difference of 13 million passengers, however, represents only about a 3-4 year difference in the time at which passenger volume would reach the higher forecast level.

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* ATA Airline Airport Demand Forecasts, San Francisco/Oakland Report, Air Transport Association, January 1971 and as revised October 1971.

As the Committee considered the variations that could occur within the assumptions necessary to the forecast, it became apparent that a forecast of 28 MAP by 1975 was more realistically 26 to 30 MAP between 1974 and 1976, and 67 to 77 MAP between 1982 and 1988 instead of exactly 72 MAP in 1985. While stated in specific numbers, this variability is inherent in all of the Committee's work.

Cargo: The revision in population projections showed a downward change in the cargo estimates, as shown below. More important, though, was the Committee's review of the original technical work that suggested a very high (85%) proportion of cargo in all-cargo aircraft by 1985. Because of the increasing use of wide-bodied and large jumbo jets, the Committee felt that the increased cargo-carrying capability would depress the use of all-cargo aircraft. A maximum of 60% was therefore assumed. The effect of this was to identify no need for separate all-cargo airports to serve the Region.

Because of the uncertainties expressed by the contractor in the cargo projections by county, no breakdown of total cargo for the Region has been included in this report.

Pounds of Cargo
(millions of pounds)

	1975	1980	1985
Original Projection	2,006	4,620	9,371
Modified Projection	1,454	3,163	6,690

Mail: The mail traffic volumes were developed in cooperation with the U.S. Postal Service. Because 80% of this mail is the result of connections between flights in and out of the Region, no basis for revision from the original forecast due to changes in Bay Area population growth rate was found.

Commercial Aircraft Movements

This element of the study related the projections of growth to the capacity of facilities at hand. It was an issue that brought together the questions of runway and airspace capacity, noise, and the efficient use of airports and aircraft. As discussed in Chapter VIII, it also brought into focus the different agency and industry authorities and responsibilities affecting scheduling, load factors, peak-hour congestion, airport facilities, and airspace.

The forecast work converted the number of passengers into aircraft movements by using the aircraft mix and scheduling patterns together with the proportion of occupied seats to determine the number of flights that would be necessary. The original work assumed an average seat occupancy factor for the Bay Region of 41% in 1975, 46% in 1980, and 47% in 1985.

After reviewing the significance of this utilization factor and after meeting with the Civil Aeronautics Board staff, the Committee adopted and used 45% in 1975, 53% in 1980, and 60% in 1985. These seat factor levels, together with increasing size of aircraft, all-cargo flight operations, positioning flights, and other non-passenger commercial airline flights, mean that the average number of passengers per commercial flight operation must increase from today's range of 30-45 to 65-70 in 1975, 80-85 in 1980, and 95-100 in 1985.*

The revised total passenger and cargo forecast together with the higher utilization factor and greater use of combination passenger and cargo aircraft lowered the total annual commercial aircraft operations in the Bay Region in 1985 from 1.1 million to 729,000.

General Aviation

A significant imbalance in general aviation aircraft ownership was found among the counties of the Region. This appears due primarily to differences in the availability of airport facilities among the counties. Using the original per capita ownership factors and the State Department of Finance population projections, the following ownerships by county of the owner's residence were forecast:

County	1975	1980	1985
Alameda	960	1200	1460
Contra Costa	600	800	1050
Marin	250	340	440
Napa	160	220	300
San Francisco	330	380	420
San Mateo	720	940	1170
Santa Clara	2100	2960	4000
Solano	180	230	320
Sonoma	380	520	700
TOTAL	5680	7590	9860

These forecast aircraft were allocated to specific airports using the ownership address/aircraft location patterns established by the tax assessor's records in each county. The total number of annual airport operations was then estimated. Where theoretical capacity would be exceeded, overloading or diversion to other airports was estimated. The detail of this process is shown in Appendix A .

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* The lower number in each future case represents airports where the larger 747 type aircraft are not in use.

AVIATION FORECAST SUMMARIES

	ANNUAL TRAFFIC		
	1975	1980	1985
PASSENGERS (000)	28,000	44,000	72,000
CARGO (millions of lbs.)	1,454	3,163	6,690
MAIL (millions of lbs.)	334	400	487
AIRLINE OPERATIONS	409,000	524,000	729,000
GENERAL AVIATION AIRCRAFT	5,680	7,590	9,860
GENERAL AVIATION OPERATIONS (000)	4,600	6,700	9,200

PASSENGER BREAKDOWN BY AIRPORT (000)

	1975	1980	1985
SFO	19,000	23,000	31,000
OAK	6,000	13,000	24,000
SJC	3,000	6,000	10,000
TRA	-	1,000	6,000
HAM/NAP	-	1,000	1,000
TOTAL	28,000	44,000	72,000

Technology Changes

Included in the forecast report, introduced in the staff briefings, and brought up at the public hearings were several possibilities for using alternative modes of transportation:

High-speed Ground Transportation: Of specific concern here was that a future high-speed ground transportation system would be built in the corridor between Los Angeles and the Bay Area and would change the need for air travel. The Committee concluded that some form of high-speed ground transportation might become available, but not as an operational system until after 1985. If it did become available, it would, according to the forecast contractor's estimate, reduce annual air passengers by the year 2000 from about 240 million to 150 million. It was noted that such a system would take a major public committment of land area and dollar resources for construction and would require high travel density for economical operation.

Short Take-off and Landing (STOL): While there is a demonstrated capability in this technology and a major Federal research committment to it, the Committee could not find a clear enough definition of function or of facilities requirements to warrant including specific alternatives in the plan at this time. This technology may offer a greater potential for noise abatement and for use of existing airports by larger aircraft than for the original concept of a downtown-to-downtown transportation system. The recommendation is to continually review this capability for specific applications.

Offshore Airports: There are extremely high capital costs for this type of airport, plus very difficult access problems. The major applicability here in the Bay Region might have been with the Mid-Bay alternative. Based upon the work done in Long Beach, San Diego, Chicago, and New York, the Committee rejected this option because substantially less costly and less environmentally disruptive alternatives were available.

California Corridor

The largest single market providing air passengers into and out of the Bay Area is the corridor between here and southern California. By comparison, it is significantly larger than any other market:

Ranking by Passenger Volume	Market Area	% of Total Air Passengers 1968	1985
1	Southern California	37	35
2	Washington/Oregon	9	8
3	New York Area	6	6
4	Chicago	4	4
5	Hawaii	3	3
6	Central California	3	3
7	International	3	3

The high frequency of flights and the competition existing in this one market provide a major capacity issue. For this reason, the Committee searched for a means of distributing the corridor air traffic over the entire Region. By distributing this particular air passenger traffic, a major reduction in average ground travel time and distance is effected. The advantage of a North Bay service point was identified in this way. As shown in Chapter VI, there is a demand in 1985 of about 2-3 million annual passengers in the southern California market. Based upon testimony from Napa and Marin County representatives, the Committee chose to accommodate only 1 million of these at one of the two North Bay sites.

Capacity

As can be seen in Figure 3, the use of airspace in the Bay Area by aircraft serving the various airports is a complex one. With respect to that airspace, the Committee found, for the system they recommended, the following:

- The ability to provide visual traffic separation during a high proportion of the time in the Bay Area allows a higher hourly flow rate than might otherwise be the case.

- OAK and Alameda have direct traffic conflicts. One Navy Ground Controlled Approach to Alameda can cancel as many as four operations at OAK.* As traffic grows at OAK, this conflict will be of more concern, but will not prevent OAK from accommodating the 1985 allocated traffic of 24 MAP.

- The separation requirements between heavy** aircraft and smaller aircraft due to wake turbulence cause about a 10% loss in aircraft movements.

	Original Capacity Estimate				Corrected for "heavy" Aircraft Separation Requirements			
	Hourly			Annual	Hourly			Annual
	VFR	IFR	Peak	(000)	VFR	IFR	Peak	(000)
SFO existing	76	51	86	424	65	44	74	370
OAK existing (South Airport)	48	42	57	221	39	36	45	179
OAK (1 new close-in runway)	-	-	-	-	68	68	79	264
SJC existing	145+	59+	213+	515+	70	70	81	320++

\+ including general aviation
++ an extended Runway 12L-30R and 100% airline activity.

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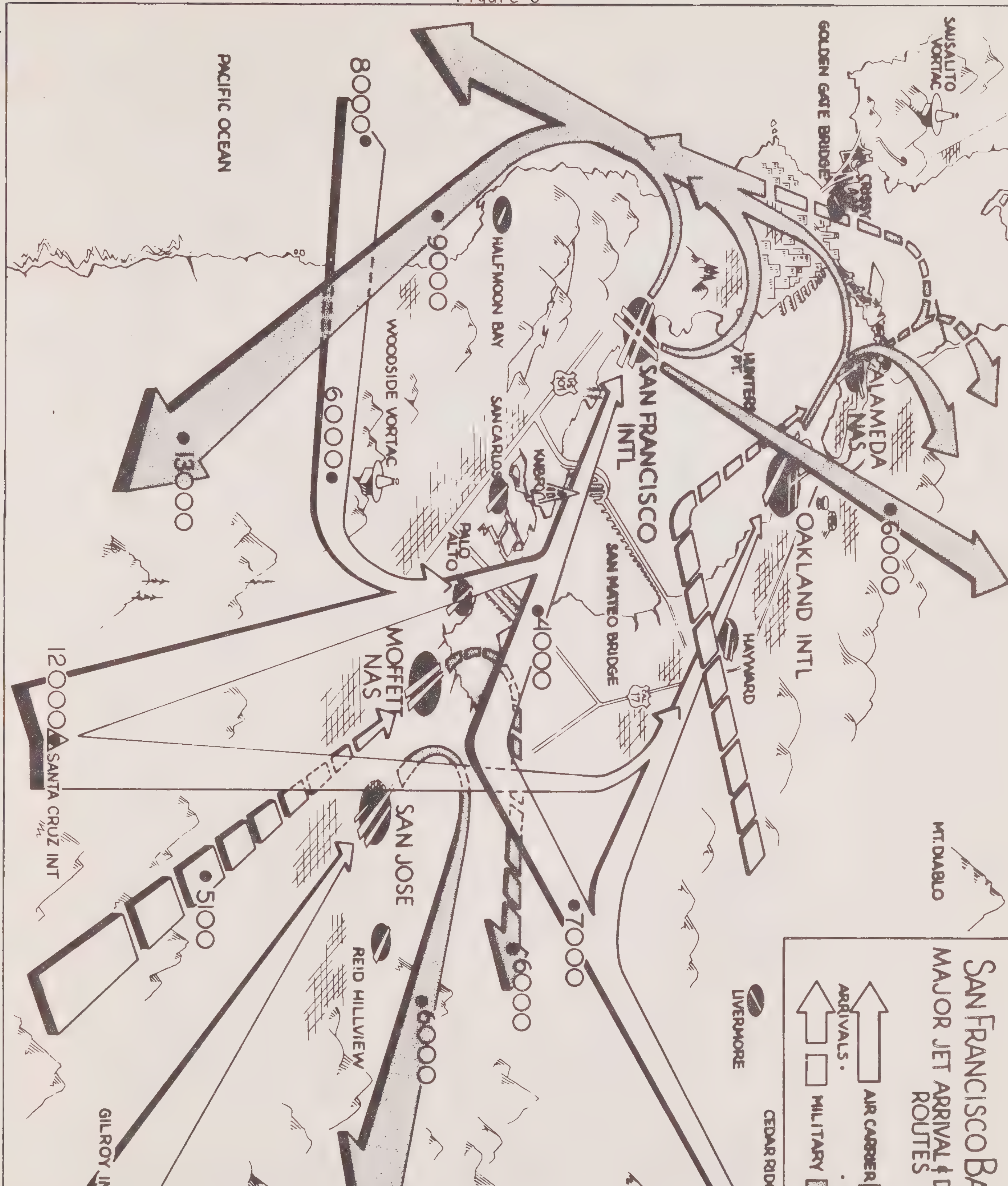
* See Chapter VII, page 4 for the specifics of this relationship.

** greater than 300,000 pounds gross take-off weight

Figure 3


SAN FRANCISCO BAY AREA
MAJOR JET ARRIVAL & DEPARTURE
ROUTES
AIR CARRIER
ARRIVALS · · DEPARTURES
MILITARY
SAUSALITO VORTAC
GOLDEN GATE BRIDGE
CRISSY
PACIFIC OCEAN
8000
9000
13000
6000
12000
SANTA CRUZ INT
HALFMOON BAY
WOODSIDE VORTAC
SAN CARLOS
PALO ALTO
SAN FRANCISCO INTL
HUNTERS PT.
ALAMEDA NAS
OAKLAND INTL
HAYWARD
SAN MATEO BRIDGE
4000
6000
MOFFETT NAS
SAN JOSE
REID HILLVIEW
5100
6000
7000
6000
MT. DIABLO
LIVERMORE
CEDAR RIDGE INT
11000
MT. HAMILTON
GILROY INT
8000

- The Committee's contractor suggests that 15-20% improvements might be possible with new computer-aided approach sequencing available about 1980. FAA disagreed and the Committee chose the more conservative capacity numbers.

- The capacity of an airport's runways to accommodate aircraft is expressed on both an hourly basis (Practical Hourly Capacity - PHOCAP) and an annual basis (Practical Annual Capacity - PANCAP). The annual capacity value is based upon specific hourly and daily variations. If, for example, the peak hour rate of 74 operations per hour for SFO were sustained for 24 hours per day, 365 days per year, SFO could theoretically accommodate 650,000 annual operations instead of the 370,000 shown in the report. The 370,000 reflects the fact that the actual operations respond to the hourly, daily, and seasonal variations in the public's demand for air travel services. Experience with other transportation problems, however, shows that travellers will eventually respond to the delays that occur during peak traffic periods by redistributing their time of travel. Though it is unlikely that full redistribution will occur, adjustments of passenger demand and airline scheduling can change the annual use. Consequently, annual capacity values should not be taken as absolutely fixed values.

- FAA advised the Committee that SFO is now approaching practical hourly capacities during certain peak periods.

- The Committee was advised that Hamilton AFB _or_ Napa County Airport could accommodate civil jet traffic, but conflicts were a problem if both were to develop.

- Travis AFB can accommodate traffic at the level allocated (60,000 annual operations) in addition to the 120,000 military operations on the existing runway system and do so within the capacity of that runway system. The future air traffic system in the Sacramento area could accommodate this additional loading.

- Area navigation capability in the terminal area is essential to accommodate this plan. Two-segment glide slope offers noise abatement advantages and possibly some relief to the lower altitudes traffic in the South Bay area.

- The congestion and delays created by multiple scheduling during peak traffic periods was a major concern. No procedure exists today to bring the airports, airlines, FAA, regulatory agencies,

and communities together on this vital issue. The Committee has suggested an initial forum to meet and discuss this kind of problem before major congestion occurs. (See Chapter VIII) The calculated capacities are known. The FAA has warned that these capacities are already being approached during certain periods at SFO.

The decision criteria used by the Committee for capacity considerations are described in Chapter IV.

Access

The significance of the ground access portion of this work was focused not just on the land or transit capacity needed at each airport, but also upon the way access, combined with airline service levels, acts to distribute (or allocate) passengers among the various airports. The issue paper in Chapter III and the decision criteria adopted by The Committee (see Chapter IV) further describe this subject area. The final recommendation involves the following findings about ground access:

- The average ground travel distance for air passengers in the Bay Area varied with the different combinations of airports considered. Where remote sites were involved (Hollister), this average distance got as high as 46 miles. When close-in site alternatives were considered (SFO, OAK, Site E, and Napa), this average distance shrank to 21 miles. While the final plan recommendation was not actually computed, that airport system probably has an average ground travel distance of about 25 miles.

- The Committee's final assumption was that by 1985 about 80% of the passengers will have a choice of airport because of better airline service. Using this assumption, the passenger levels allocated by the Committee to each airport would be somewhat similar to the distribution based on passenger choice. This is true except for San Jose in 1980-85. Here, an artificial constraint (due to environmental issues) will require something in the order of 8 MAP to divert to SFO and OAK from the San Jose area.

- The estimated travel time over the 1980 highway network envisioned by BATSC is:

	To Airports (minutes)					
Downtown	SFO	OAK	SJC	NAP	HAM	TRA
San Francisco	20	32	50	59	50	86
Oakland	40	19	53	51	56	78
San Jose	45	44	13	90	98	110

- Because the highway capacities are of concern at SFO and OAK at the 1980 to 1985 allocated activity levels, transit and additional highway capacity will be essential. Oakland particularly will require additional highway capacity for access as well as transit connections. The Committee, wanting to place emphasis upon transit access, chose the alternatives most likely to gain that access and then raised the assumption of the maximum percentage of passengers likely to use transit from 18 to 23, in order to clearly make transit access a condition of the recommended plan. Diversion of San Jose traffic to both SFO and OAK will depend heavily in later years upon transit as a dependable access mode.

- Construction of the Southern Crossing was originally assumed in the ground access analysis. It was also reviewed in the San Francisco Airport Access Project. This work showed that the Southern Crossing would not be a significant factor in the allocation of passengers among the airports. However, the highway lane capacity is important to future growth at OAK. The Committee has concluded that it is possible that the Southern Crossing will not be built. The East Bay portion of the Southern Crossing road system (the Grove-Shafter extension and Route 61) do however remain as very important parts of OAK highway access capacity. If that road system is not built, additional routings will be needed and heavier reliance on transit will be required.

ABAG, in cooperation with MTC, will in 1973 take the final passenger allocation represented in this plan and make a detailed analysis of the land and transit requirements for the plan. This work will also be coordinated with the two transit access studies presently underway at SFO and OAK.

Environmental Considerations

This element, unknown to studies of this kind five years ago, was included as one of the major subjects to be investigated. Specific work was done on air quality and noise and general work was done in a separate report to identify environmentally sensitive issues - human and wildlife habitats. Though not a part of a separate report, a review was also made of ABAG's open space plan element and some of the preliminary work done on the joint ABAG/U.S.G.S. San Francisco Bay Region Environment and Resources Planning Study. A major concern in the Bay Area is Bay fill. This subject is summarized in a separate issue paper in Chapter III.

Air Quality

The work done by the Bay Area Air Pollution Control District depended heavily upon assumptions furnished by the ABAG staff as to the level of use that each airport would reach. Because this work was done more than a year before the Committee's final recommendation, the traffic levels

used in it are different (higher) than the actual recommendation. Since that time, the following Committee actions were taken:

- higher aircraft utilization was made a part of the decision criteria
- passenger projections were revised to reflect reduced population growth
- a redistribution of airline traffic with SJC less than its runway capacity occurred

In tabulated form, these changes then appear:

	1985 Annual Airline Operations(000)	
	Original ABAG staff estimates used by BAAPCD	Final Committee Action
SFO	469	310
OAK	357	240
SJC	255	105
TRA	*	63
HAM/NAP	*	11
TOTAL	1081	729

The effect of this change is to reduce the 1985 airline aircraft emissions originally estimated at these airports by about one-third - from 270 tons per day to about 200 tons per day (including general aviation). Another, and perhaps more significant, point is that the emissions are reduced the largest amount in the most critical zone, SJC (zone III-t-IV).

The original BAAPCD work included all of the activities of aircraft, fueling, and ground vehicular traffic at the airport. The actual ground access trip to the airport was left until the actual airport alternatives were chosen and the average trip distance was known. As estimated in the access part of this chapter, the average ground trip for all air passengers is about 25 miles. This has been calculated to produce about 80 tons per day in automobile emissions for passenger and employee travel.

The following tabulation summarizes the total 1985 emissions for the Region:

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* Total airline operations were, in the original work, divided among the 3 major existing airports. The alternative chosen includes Hamilton or Napa and Travis, and operations are allocated between all five airports.

	Total Air Emissions, 1985 (tons per day) Original Estimate	Final Plan Recommendation
Total Nine-County (all sources)	3584	3600
Aircraft	270	200
Other Airport	10	10
Automobile Access to Airports	-	80

Three assumptions used in this work are significant to the rise of aviation from about 1.5% of the present total air emissions to about 6% in 1985*:

- the 1975 Federal motor vehicle emission standards will be met.

- there will be no improvement in aircraft engine emissions beyond the clean burner cans for reduction of visible smoke on the JT8D jet engine.

- residual fuel dumping will cease by 1975.

There is a possibility that these assumptions may change.

The BAAPCD noted in their report that wide variations exist in the technical data for components of air emissions from certain jet engines. The Air Transport Association in its technical review (see Chapter VII) pointed out these variations and suggested that the data finally selected were too high. ATA also pointed out that the specification for maximum sulfur content, used in fuel purchases, is two to three times higher than that of the actual fuel delivered.

Noise

This subject area, while long a concern in many airport communities, was an area where the Committee found the greatest confusion of "fact." Among the problems they found were:

- Until 1971 there was no regulation of noise in the certification of jet aircraft. Consequently, large numbers of "noisy" jet aircraft certificated before that time are in use today. Also, those same aircraft once certificated can be and are being manufactured and sold after 1971.

* If automobile access to airports is included, 1985 would be 8%.

- There is no regulation of noise resulting from aircraft operations at an airport.*

- The only absolute way an airport can prevent encroachment of residential areas into noise areas is to own the land. Attempts at zoning have failed time and again to provide adequate protection.

- There has been no direct way a community can prevent increased aviation noise unless the citizens impacted by noise are the electorate that owns the airport. In these cases, curfews and limits on flight operations and types of aircraft are exercised, as well as restrictions upon size or capability of the airport facilities themselves.

- Once an airline is certificated to serve an airport, there is currently little an adjacent community can do. The airlines have virtually unilateral authority to generate noise outside of controls by the Federal Aviation Administration, Civil Aeronautics Board, the airport owner, or the community.

Working with these problems as a beginning point, the Committee was concerned about the aviation noise situation today and what effect its various airport alternatives, and its final aviation plan, would have on residents in the Bay Area.

Finding a suitable measurement for analyzing community noise impact was difficult. There exist a number of sound measuring techniques that evaluate a single noise event. Some measure loudness or sound pressure levels. Others measure loudness and correct for pitch and tone effects of the noise as the human ear perceives it, and yet others correct for the time interval over which the noise is heard. But perception of noise as a problem has to do not only with loudness, but also with how often it is heard and at what time of day. Attempts have therefore been made to calculate indices that could be used to forecast the composite "bothersomeness" of aircraft noise. The Committee was warned by the airline industry that a great deal more needs to be known about these indices and how they relate to human response.

While the State of California proposed noise regulations are not yet effective, they are the only criteria available for relating aircraft noise and the airport community. The Committee also looked at the Noise Exposure Forecast (NEF) procedure developed under an FAA contract. Both of these systems attempt the same thing - to relate loudness, number of noise

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* As a result of Section 21669 of the State Public Utilities Code, State regulation would become effective in December 1972.

applications, time of day, and the length of time of each noise event. The State procedure is developed from actual measurements. The NEF procedure forecasts the noise from some initial measurements.

The Committee adopted the NEF procedure for forecasting the effect of present and future aircraft operations in the Bay Area. It also adopted the proposed State regulations as a standard of measurement for compliance.

The NEF level adopted by the Committee as that causing concern for residential development was 30-35 and above. The initial work done would show the following land areas within certain NEF levels:*

Aviation Noise Impact on Residential Areas

	1970 Traffic NEF Levels				1985 Traffic NEF Levels**			
	30-35	35-40	40-45	>45	30-35	35-40	40-45	>45
SFO								
Residential Acres	2,294	1,044	310	38	1,420	626	76	0
Residential Residences	14,574	6,514	1,577	156	9,139	3,424	361	0
OAK***								
Residential Acres	86	0	0	0	213	7	0	0
Residential Residences	444	0	0	0	1,131	42	0	0
SJC								
Residential Acres	360	85	34	10	426	111	29	5
Residential Residences	1,390	317	136	47	1,699	438	108	24

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* A separate report, Airport Noise and Land Use Analysis, provides a computer program and land use data bank to calculate impacted areas from various contours.

** These 1985 traffic levels are for the existing runways operating at capacity: SFO = 424,000 (382,000 airline); OAK = 221,000 (all airline); SJC = 398,000 (117,000 airline) annual operations.

*** It was pointed out during the public response that flight path procedures flown at OAK are different from those assumed in the above calculations. The effect of this would be to reduce residential impact areas.

By 1985, California State regulations will require existing airports to have no residential areas in the 65 CNEL level or above. This is equivalent to approximately 30 NEF or above. The 65 CNEL criteria now applies to new airports and to civilian use of military airports.

As can be seen, the noise decision criteria (see Chapter IV) could not be met at any of the three airports under this original assumption of traffic. The Committee felt that it was reasonable to assume that its noise criteria could be met at each airport if:

- a higher aircraft utilization than originally assumed allowed the same number of passengers to be carried in fewer flights

- a reduction in the forecast also reduced the total number of flights required

- a diversion of some civil flight operations to Travis and Hamilton AFB occurred. Existing noise impact from military traffic would not appear to be noticeably increased.

- early retirement or engine retrofit of 727, 737, and DC-9 aircraft took place. The initial forecasts for 1985 included a number of pre-Federal certification standard airplanes in the mix.

- no conversions of existing compatible land uses occurred

- no construction of residential areas in lands that are now vacant in the present and future impact areas occurred

- certain critical existing residential areas were acquired by the airports and the use changed from residential

- technology would allow the two-segment approach to be applied to all landing aircraft

It should be realized that the original noise contours done for the Committee were for a specific set of conditions. Changes in operating procedures, aircraft mix, or numbers of aircraft can cause sizeable changes in those contours. It is also possible that improved knowledge about aircraft noise and human response will provide better information and noise forecasting procedures. The monitoring now being installed at the major airports will be very helpful in this regard.

The forum suggested in Chapter VIII, the information and decision criteria developed in this study, the individual county airport land use commissions, the State noise regulations, FHA criteria on noise,and environmental impact statement requirements will all interact to allow us to deal for the first time in a positive way with aircraft noise.

Other Environmental Considerations

A major effort was made to somehow systemize the consideration of environmental issues in an environmental impact report contracted for the study. While a good general inventory of environmental resources resulted, it was very clear that we have a great deal to learn about the interactions of human, plant, and animal life. The Committee felt that it was not able to deal with these issues with a definite analytical procedure, but tried to subjectively judge the relative importance of the various areas of concern. The following sources are a partial list of the material reviewed for this purpose:

- The San Francisco Bay Plan, Bay Conservation and Development Commission
- Open Space Plan Element, ABAG
- Physical Resources of the San Francisco Bay Area, ABAG
- San Francisco Bay Region Environment and Resources Planning Study, ABAG/HUD/U.S.G.S.
- South Bay Wildlife Refuge Plan
- Golden Gate National Recreation Area
- New Communities in the Bay Area, ABAG
- Regional Plan 1970:90, ABAG

The recommended plan makes maximum use of already developed land areas. It avoids placing new airports in ecologically sensitive areas, and avoids conflicts with the wildlife and open space plans for the Region. The proposed South Bay wildlife refuge was a major reason for the rejection of a major facility in that area.

Looking at all of the issues involved, the Committee did choose an alternative which includes Bay fill at OAK. This would be required by 1985 in order to construct a new runway needed to accommodate the allocated traffic level.

Economic Impact

The original eleven airport alternatives were tested for economic benefits. The evidence indicated that, from a regional point of view, the total basic aviation-oriented employment in the Region remains unchanged regardless of which airport options are chosen. It did make a significant difference, however, to individual communities in terms of employment location, housing sales tax generation, and population-serving employment activity. The Committee was concerned with Region - wide benefits rather than specific community advantages.

The Association's Regional Plan calls for a city-centered concept of development, focusing on existing urbanized cores with some new or expanding communities located at the fringes of the core area. Airline airports at

the outer edges of the urban areas tend to relocate employment and urban growth away from the core area if the airport is large. At a smaller size, however, such an airport could provide a modest new employment center, while leaving the major job centers within the existing housing/employment centers. This latter case is characteristic of the aviation plan chosen.

To illustrate this, the following table shows the estimate of employment and acreage change between 1965 and 1985 activity levels for the airports in the plan. The basic employment levels from the original report have been proportionately adjusted where necessary to reflect the final plan recommendation. The Bay Area Transportation Study Commission (BATSC) zone numbers represent the built-up areas associated with the airports.

Basic Civil Aviation Employment and Land Area Required to Support Employment

	BATSC Zone	1965 MAP	1965 Employment (000)	1965 Acreage	1985 MAP	1985 Employment (000)	1985 Acreage
SFO	61/66	8.7	34.3	3,300	31	59.2	3,800
OAK	255	1.0	11.9	2,400	24	26.5	1,900
SJC	186	.13	14.4	2,100	10	24.0	1,400
HAM	49	-	-	-	1	3.0	1,300
NAP	109	-	-	-	1	3.6	300
TRA	118	-	-	-	6	5.2	1,200
TOTALS		9.83	60.6	7,800	72	117.9*	9,600*

* Only HAM included in the total.

Capital Cost

The cost estimates that were prepared for this study were based on some variations of the initial eleven airport alternatives. As with other portions of the study work, modifications to the original analyses were necessary to reflect the final recommended plan. These modifications are included in Appendix C.

The cost estimates are conceptual in nature and provided the Committee with a measure of the relative cost of each of the various alternatives. They also provided them with some insight into whether or not the increments of development could be financed and how.

A summary of development cost estimates for each of the time periods follows:

	Estimate of Capital Cost ($ millions) (Public Funds Only)		
	1975*	1980*	1985*
SFO	90.0	120.0	244.7+
OAK	16.5	34.8	111.2+
SJC	25.0**	65.0	100.0+
HAM	-	11.7	11.7
NAP	-	16.1	16.1
TRA	-	8.4***	27.9****
G/A	++	++	47.7
TOTAL	131.5	239.9+++	543.2+++

* Figures are cumulative from the present.

** These estimates were obtained from SJC capital program.

*** Assumes joint use of the existing runway system.

**** If a completely separate runway were required, the land and construction cost would raise this to 32 or 66, depending upon whether a close-in or wide-track runway configuration were used.

\+ These figures do not include transit.

++ General aviation estimates are given only for 1985, and not pro-rated for 1975 and 1980.

+++ Totals include HAM and not NAP.

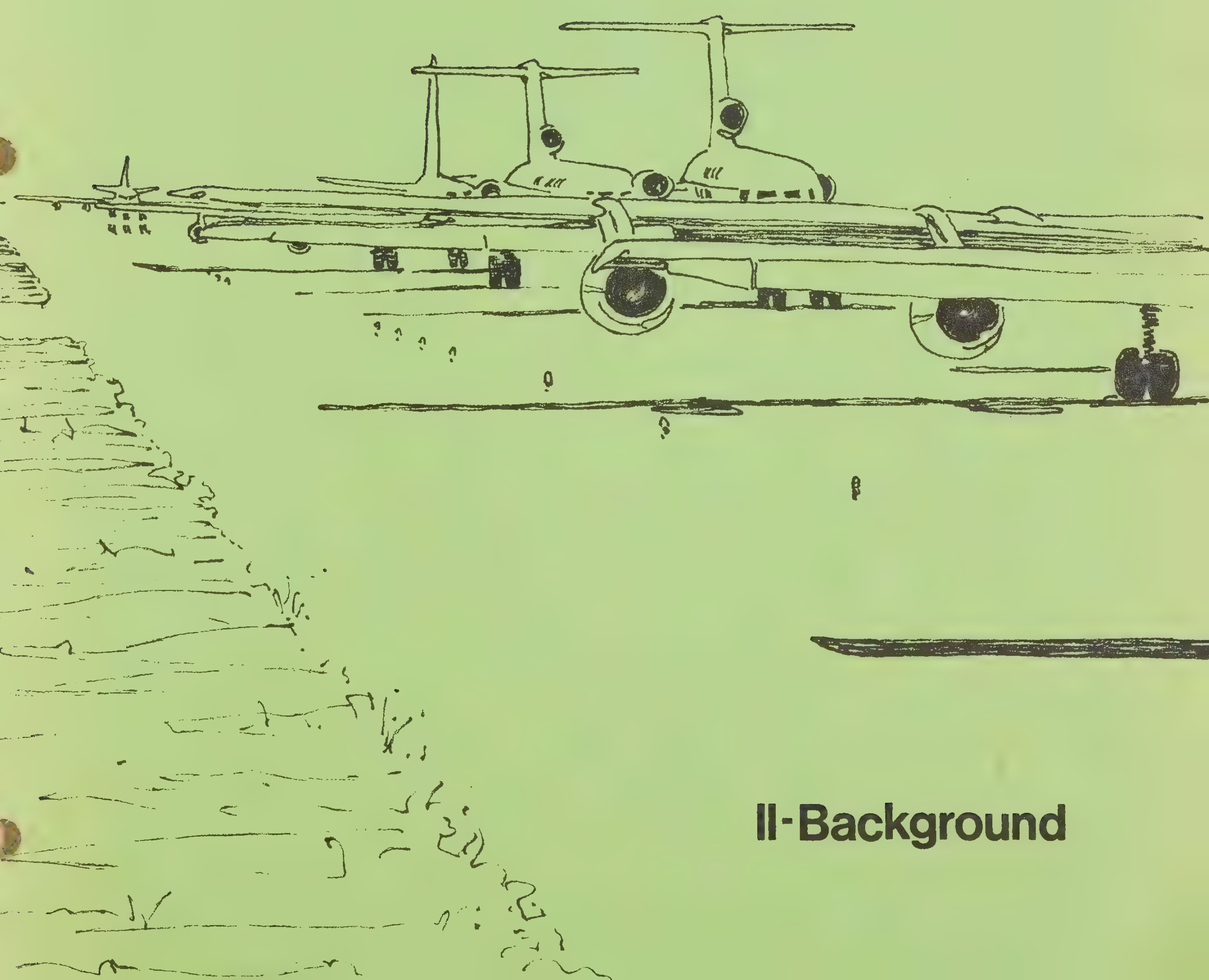
As the size of the airline airport increases, the proportion of capital development provided by private funds increases. As was noted in the original report, about 80% of the investment to date at SFO is private monies.

	Total Present Investment (millions $)			
	SFO	OAK	SJC	TOTAL
Public	251.4	45.5	3.9	300.8
Private	842.1	1.5	1.1	844.7
TOTAL	1093.5	47.0	5.0	1145.5

The extent of public and private long-term committments was significant to the Committee and was one of the issues that caused them to focus on a high utilization of the airports at hand.

The very high cost of transit extensions to remote airport sites, $1.1 billion for Hollister and $520 million for Travis, was of major concern to the Committee. While realizing that the extension from Fremont to Hollister would be allocated to many other uses other than airport access, the cost of even a 10% allocation is very large($110 million). Recognizing the use of transit as an important access capacity requirement and a very desirable environmental factor, the Committee identified the close-in airports of SFO and OAK as the most probable of being connected to BARTD. The limitation on the size of SJC will require the movement of about 8 million passengers annually to SFO and OAK from the Santa Clara County market area in 1985, and transit could be important to that passenger movement.

The extension of the BARTD system to Sacramento has been studied for some time, and the Committee considers this to be a possibility. With the initial development of Travis to 1 MAP and later to 6 MAP, transit is not a requirement. However, later airport growth could make the transit possibility to Sacramento very important to that airport.



II-Background

CHAPTER II

BACKGROUND

The Regional Airport Systems Study (RASS) was aimed at preparing a long-range airport systems plan that takes thorough account of all aviation needs, area resources, and diverse public interests in the Bay Region.

Several years ago it became apparent that the growing demand for aviation services in the Region presented problems and questions which had broad impact throughout the Region and which had to be answered. The City and County of San Francisco, the Port of Oakland, and the City of San Jose, as owners of the three major regional airports, entered into a joint exercise of powers agreement in 1967 to study the need for future facilities to serve aviation users. The result was the Bay Area Study of Aviation Requirements (BASAR).

Because the problem was a regional one, with impacts on people and environment throughout the entire Bay Area, the Association of Bay Area Governments (ABAG) joined with BASAR in 1969 to form the Regional Airport Systems Study as part of its planning program. To make the study responsive to public interests throughout its entire development, a Study Committee was appointed, consisting of an elected official from each of the nine counties together with representatives of the three major airports. This Committee was given the responsibility of setting the goals and policies of the study, guiding the direction of the effort, and making the final recommendations. The emphasis has been regional; the attempt has been to anticipate and solve, through planning, the huge number of complexities and conflicts before they occur.

REGIONAL AIRPORT SYSTEMS STUDY COMMITTEE

COUNTY OF ALAMEDA:
William M. McCall
Alameda City Councilman
Vice-Chairman of the Committee

COUNTY OF MARIN:
John F. McInnis
Marin County Supervisor

COUNTY OF NAPA:
Marshall Sears
Napa County Supervisor

CITY AND COUNTY OF SAN FRANCISCO:
Quentin L. Kopp
San Francisco County Supervisor

COUNTY OF SAN MATEO:
William R. Lawson
Former Councilman of Menlo Park

COUNTY OF SANTA CLARA:
Ralph H. Mehrkens
Santa Clara County Supervisor

COUNTY OF SOLANO:
Thomas Hannigan
Mayor of Fairfield

COUNTY OF SONOMA:
Helen Putnam
Mayor of Petaluma

METROPOLITAN OAKLAND INTERNATIONAL AIRPORT:
Ben E. Nutter
Executive Director, Port of Oakland

SAN FRANCISCO INTERNATIONAL AIRPORT:
James K. Carr
Director of Airports

SAN JOSE MUNICIPAL AIRPORT:
James M. Nissen
Airport Manager

COUNTY OF CONTRA COSTA:
Warren N. Boggess
Contra Costa County Supervisor
Chairman of the Committee

City and County of San Francisco were represented by Supervisor Ronald Pelosi until April 1972.

San Francisco International Airport was represented by George M. Hansen until June 1971.

Alternate for Supervisor McInnis: Ray W. Foreaker, Jr.

Alternate for Supervisor Pelosi: John Schellenberger

FUNDING

The Regional Airport Systems Study was funded by federal and local sources over a period of almost three years, as follows:

3 Major Airports	$135,400
ABAG	60,400
HUD (Dept. of Housing and Urban Development)	350,000
FAA (Federal Aviation Administration)	41,700
TOTAL	$587,500

Technical Studies

The first step of the study process was the collection of basic information: an inventory of available aviation facilities and data concerning airport capacity, airspace capacity, and ground access. A forecast of future demands for aviation services was also undertaken. These studies were then implemented by four environmental reports, two economic reports, and supplements to the capacity and access work. The major pieces of this fact-gathering and analysis were accomplished through sub-studies done by consulting specialists. To coordinate this work and to consolidate and analyze the results, a small study staff was appointed, with Walter E. Gillfillan as Study Director.

Alternatives

At the beginning, the Study Committee considered existing and possible new airports in the Region and selected eleven preliminary alternatives for detailed study - eleven ways in which the various airports might be developed in combination. These alternatives were by no means exclusive; rather, they served to orient the technical studies around widely varied, yet specific, possibilities and provide a focus and point of reference. This approach allowed modifications and additions which could then be compared with the original alternatives and with each other. (Refer to Chapter IV for a detailed discussion of Alternatives.)

Issue Papers

Another important element of the technical studies was the development of issue papers by staff. Originally, these papers were written to summarize and interrelate the technical reports; as they evolved, they expanded to include many additional subject areas which the Committee identified and wished to investigate in some detail. The papers were especially useful in emphasizing the complex relationships between the various subject areas, and pointed to the coming process of weighing and balancing the many factors to be considered in making a decision.

Public Participation

Throughout its course, the Study Committee encouraged response from concerned groups and individuals to incorporate into its evaluations. Over thirty Committee meetings, open to the public, were held during the study. Ex-officio members were active participants in the study, and representatives from many organizations regularly attended the meetings and conferred with staff and Committee.

Perhaps the most important facet of this open process was the opportunity for citizens to advise the Committee on issues and points of view prior to Committee decision. Public hearings were held throughout the Region at five locations: Fairfield (November 1971), Oakland (December 1971), San Jose (January 1972), San Francisco (February 1972), and San Rafael (February 1972). Speakers presented their opinions and suggestions, resulting in over 600 pages of transcribed testimony.

In addition, 30,000 copies of a four-page informational newspaper were distributed throughout the Region over a period of seven months. A questionnaire in the paper soliciting positions and priorities was responded to by 850 people, and a computer analysis was made of the results. 950 letters were also received. A more detailed description of citizen response is included in Chapter V.

The Decision Process

Because of the large number of elements included in it, the aviation study was a continually-evolving process. The most difficult achievement was putting all of the pieces together as they were being modified and expanded.

The Study Committee had to survey all of its materials from several points of view: technical, economic, social, and environmental. Out of the studies, coordination, and response, some sort of ordering of concerns and priorities had to be established. For this purpose, a goal and policies were formulated to give the decision process guidelines and direction. Goal and policies were further refined into specific decision criteria for five of the subjects considered: forecast, access, capacity, noise, and air quality. The decision criteria were developed to respond to the input from as many sources as possible in order to be both responsible and realistic.

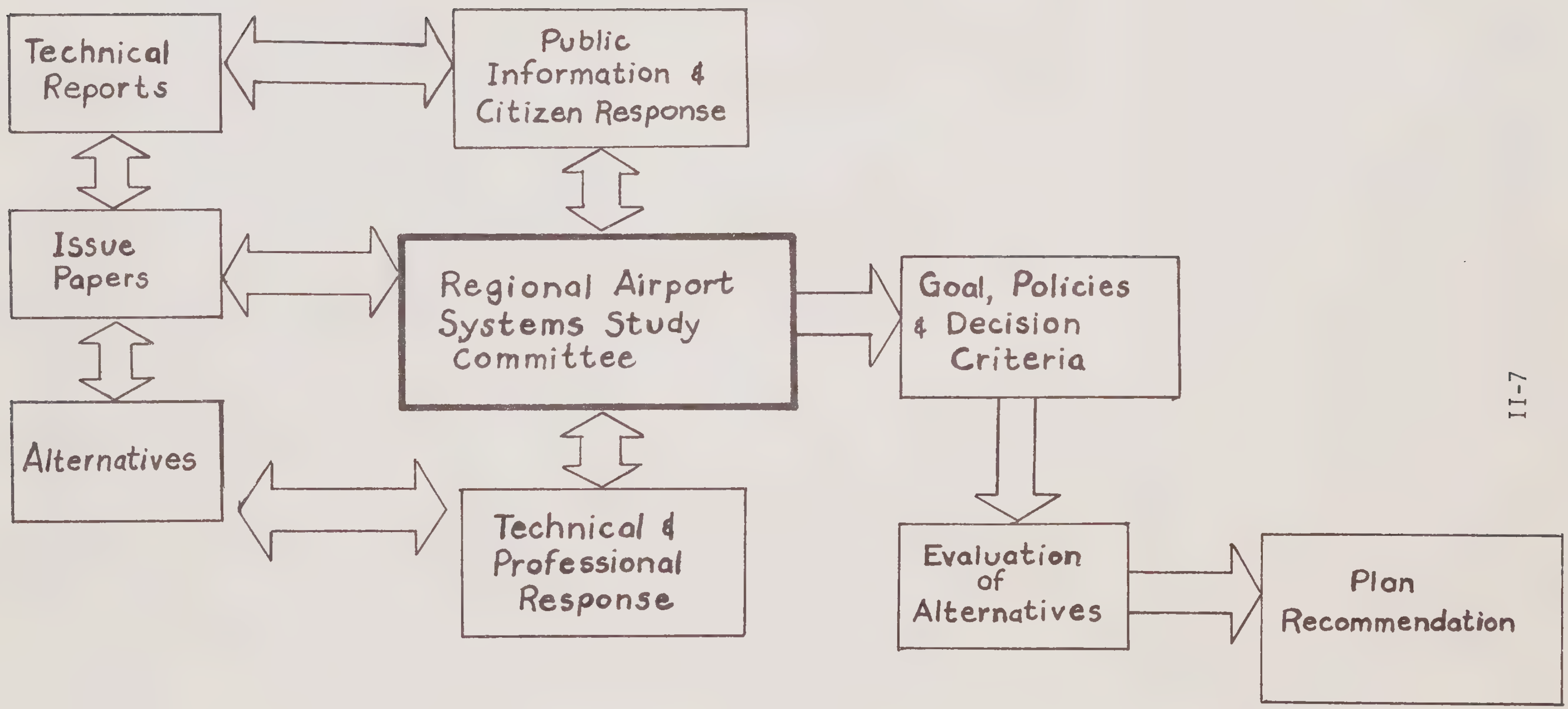
The process became complex and arduous. Conflicts between decision criteria occurred for some of the alternatives and had to be resolved; questions had to be foreseen and answered. How much growth should be accommodated? Should or can high-speed ground travel substitute for some of the aviation demand? Do all segments of society benefit from air travel? What priorities are appropriate among airspace users? Among environmental impacts, does reduction of noise justify development of open space or the filling of the Bay? Will passengers use an airport which requires long access travel times? Will airlines put service there?

In this way, the alternatives were accepted, modified, and rejected. Public hearings sometimes resulted in the elimination of some alternatives which might have seemed feasible on purely technical grounds. Economic factors

constrained plans which seemed environmentally acceptable; environmental concern prohibited financially reasonable alternatives in other cases. In no case was any solution an ideal one, fitting all of the criteria and limitations.

The Recommendation

An aviation plan recommendation was made by the Regional Airport Systems Study Committee at its June 2, 1972 meeting. It is the solution which in the Committee's judgment best accommodates the Region's needs and fairly reflects its wants. When adopted by the ABAG Executive Committee, the recommendation will become the Aviation Plan Element of the ABAG Regional Plan 1970:90. Implementation will then be achieved through the ABAG grant review process and through the continuing coordination of involved groups and agencies.



REGIONAL AIRPORT SYSTEMS STUDY PROCESS

AGENCIES AND ORGANIZATIONS PARTICIPATING IN THE REGIONAL AIRPORT SYSTEMS STUDY

FAA (Federal Aviation Administration)*
BCDC (Bay Conservation and Development Commission)*
BARTD (Bay Area Rapid Transit District)*
Business and Transportation Agency*
Bay Area Council*
State Department of Aeronautics*
Department of Defense*
MTC (Metropolitan Transportation Commission)*
Federal Highway Administration*
CAB (Civil Aeronautics Board)
HUD (Department of Housing and Urban Development)
BAAPCD (Bay Area Air Pollution Control District)
airport managers
airport land use commissions
city and county planning departments
PUC (California Public Utilities Commission)
EPA (Environmental Protection Agency)
Sierra Club
League of Women Voters
Save San Francisco Bay Association
Air Transport Association
President's Aviation Advisory Commission
Save Our Valley Action Committee
People for a Golden Gate National Recreation Area
U.S. Army Corps of Engineers
San Francisco Bay Regional Water Quality Control Board
U.S.G.S. (U.S. Coast and Geodetic Survey)

* ex-officio members of the Regional Airport Systems Study Committee

III-Technical Studies

CHAPTER III

TECHNICAL STUDIES

The collection and analysis of data was a major part of the Regional Airport Systems Study, and was accomplished by various sub-contractors to the Committee. In this way, experts in each area of study contributed to the effort.

Inventory

The beginning was taking inventory of existing aviation facilities, in order to provide a starting point for future evaluations. The inventory presented this kind of picture:

- There are 54 airports in the Region; 34 are for public use, 5 are for military use, and 15 are restricted to private owners' use. (Inventory Report)

- The three major airports are well located with respect to the population. (Inventory Report)

- Urban expansion has put residential neighborhoods into close proximity to all three major airports. (Inventory Report)

- Capacity of the existing airports exceeds present activity. (Capacity Report)

- The existing civil airport system can operate to capacity without serious airspace congestion, but military operations at Alameda and Moffett can limit this capability. (Capacity Report)

- In 1968, Bay Area airports accommodated:

  16 million passengers (up to 20 million in 1970)
  580 million pounds of cargo
  284 million pounds of mail
  400,000 commercial aircraft operations
  2.5 million general aviation operations

  (Forecast Report)

- In 1968, passengers chose the following ground modes to airports:

highway (personal auto)	88.6%
transit (public vehicle)	11.4%

  (Access Report)

- In 1968, passengers used the airports to this extent:

SFO	82.4%
OAK	11.1%
SJC	6.5%

(Forecast Report)

- San Francisco County is currently the principal air passenger generator, followed by Santa Clara and Alameda Counties. (Forecast Report)

- The largest single market area is Southern California, accounting for about 37% of all origins and destinations for air passenger traffic using Bay Area airports. The next largest markets are Washington/Oregon (9.4%) and New York/Newark (5.7%). (Forecast Report)

- General aviation airports are well scattered throughout the Region, except for not being within easy reach of San Francisco and western Contra Costa County. (Inventory Report)

- Many outlying areas depend on privately owned airports for general aviation. Permanence of these may be threatened by urbanization. (Inventory Report)

- Several general aviation airports which were formerly military facilities could accommodate airline and business jet aircraft. (Inventory Report)

<u>Forecast, Access, and Capacity</u>

The first round of technical studies also included reports on aviation forecasts, airport access, and airport and airspace capacities. This work, done in mid-1970, was updated later to include new alternatives being considered and also to accommodate certain changes in information or assumptions. Supplemental reports were prepared for the access and capacity work, and new studies of forecasts were made.

<u>The Environment</u>

The second round of studies, done in 1971, emphasized environmental investigations. The environmental issues - air quality, noise, and land use - were treated on an equal basis with the more traditional study items of forecasting, access, capacity, and so forth, not as a tag-on effort after a decision had been reached. Public concern and response confirmed the need to devote a substantial amount of the study to these questions.

Economics

Cost analysis and an evaluation of potential economic benefits completed the set of technical reports. Also done in 1971, they were another planning factor to be considered in the decision process.

Issue Papers

As the study developed, it became clear that each technical subject area was surrounded by assumptions and issues which had to be further explored. It was clear also that each area was not isolated, that there were connections, dependencies, and sometimes conflicts which had to be recognized and resolved. The staff therefore prepared a series of "Issue Papers" which summarized and interrelated the various subjects. These papers presented the assumptions and issues one by one so they could be accepted, modified, or rejected by the Committee as it attempted to judge both the validity of the technical work and the values and policies connected with it.

As this process evolved, subjects other than those specifically covered by the technical reports were identified and also investigated through issue papers or memoranda. Some were suggested by the Committee, some by staff, and some by organizations or individuals at meetings and public hearings.

Spread over a period of seven months, the issue papers responded to questions as they arose, and so provide a continuous documentation of the study process. They are included here as the working papers of the Regional Airport Systems Study Committee.*

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* Not all parts of the issue papers were accepted by the Committee and formalized into decision criteria or incorporated into the recommendation. Those elements which were are included in Chapters I and IV.

  Data or assumptions which have been revised since the issue papers were written are footnoted and can also be found in Chapters I and IV and in the appendices.

REGIONAL AIRPORT SYSTEMS STUDY PUBLICATIONS

Airport and Airspace Capacity Analysis, R. Dixon Speas Assoc., May 1970; supplementary report October 1971.

Airport Access, Wilbur Smith and Associates, June 1970; supplementary report October 1971.

Aviation Forecast, Systems Analysis and Research Corp., May 1970

Airport Inventory, Walter E. Gillfillan, Paul D. Spiegel, and Wilsey and Ham, July 1970.

Summary Report, Phase I, August 1970.

Aviation Effect on Air Quality in the Bay Region, Bay Area Air Pollution Control District, February 1971.

Aviation Noise Evaluations and Projections for the Bay Region, Bolt, Beranek and Newman, September 1971.

The Effect of Aviation on Physical Environment and Land Uses in the Bay Region, Wilsey and Ham, August 1971.

Economic and Spatial Impact of Alternative Airport Locations, William Goldner (University of California) and Mitchell Research Associates, Inc., September 1971.

Capital Cost Analysis of Airport Alternatives, Bechtel, Inc., October 1971.

Airport Noise and Land Use Analysis, Paul K. Dygert, Judy A. Ungerer, and Fred L. Collins, October 1971.

Public Hearing Testimony, November 1971 through February 1972.

At the request of the Study Committee, the following report was also prepared for use in the study (not as a contracted report):

A Dynamic Simulation Study of Air Traffic Capacity in the San Francisco Bay Terminal Area, Paul J. O'Brien, National Aviation Facilities Experimental Center (prepared for the Dept. of Transportation, Federal Aviation Administration), August 1971.

Travel demand forecasts are the major indication of what airport facilities are going to be needed in the future. Settling on the basis of such forecasting was perhaps the most fundamental and difficult part of the study. Yet, estimates are essential, and misjudgments can lead to facilities adding up to far too little or far too much.

The forecasting dealt with various kinds of demands, including those of general aviation and of cargo, but it is the forecast of passengers that almost entirely governs the needed development of major airports.

Passengers

The forecasting procedure used consisted of computing future numbers of air passengers from factors to which numbers of passengers are known to be related: population, per capita income, and per capita employment.

The initial report, submitted in May 1970, predicted demands as growing to 83.5 million passengers per year by 1985, as compared with roughly 20 million in 1970. This forecast was based on population and employment figures computed for the Bay Area Transportation Study Commission and income figures estimated by the contractor. At the time, the Committee felt that these assumptions were reasonable, or at least as valid as any others existing at that time.

Then the 1970 census figures became available, indicating a substantially lower population growth rate. Shortly thereafter, the California Department of Finance published a population forecast in which the figures were significantly lower than those in previous forecasts. This brought the reliability of the initial aviation forecast into question.

Independently, the sub-study on environment raised the question of whether unrestricted population growth was the most desirable planning basis. This viewpoint, as well as concern about the possibility of overestimating population growth, even if unrestricted, was strongly emphasized at the public hearings.

As a result, the Committee ordered a recalculation of future travel demands, using different projections of population, and of income and employment as well. Calculations were run showing how forecasted travel demand would vary with different combinations of the three factors.

Results ranged from 57.9 to 95.5 million passengers per year in 1985, depending upon the population growth rate, income, and employment values used.

As a basis for its plan, the Committee adopted the forecast based on the Department of Finance growth rate, with per capita income and employment unchanged from the initial forecast. This established a new planning base of 28 million passengers in 1975, 44 million in 1980, and 72 million in 1985.

Cargo, Mail, and General Aviation

Forecasts for cargo and general aviation, based in part on population, were revised downward to reflect the smaller Department of Finance figures. General aviation was also seen to be constrained by the lack of facilities available in some counties.* Mail cargo forecasts, developed by the contractor in consultation with the U.S. Postal Service, were adopted as originally forecasted.

Predictability

These forecasts include the assumption that significant variations will not be brought about by dramatic changes in a variety of other influences - economic conditions, air travel cost and quality, rapid-rail competition, changes in people's life styles, to mention but a few. All these things contribute to the uncertainty.

There is, however, a way to minimize the effects of such uncertainty. This is to regard any error in prediction - should that prove to be the case - as an error in time rather than in amount. If, for example, population turned out to grow faster than assumed, it would merely mean that the need to accommodate more passengers would appear a few years sooner than forecast.

If the problem is looked at in this way, developments which take a long lead time can be planned in small stages, and starting dates for the later stages attuned to the actual, or more predictable, situation at that time.

The Committee, by adopting the revised forecast, provided a basis for proceeding to take care of the relatively certain short-term needs while leaving flexibility in plans for meeting long-range projections.

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* Refer to Appendix A for a detailed breakdown of general aviation forecasts.

AVIATION FORECAST*

ASSUMPTIONS/ISSUES PAPER

INTRODUCTION

What we believe the future demand for air transportation in the Bay Region will be is one of two principal factors which will be used to judge the adequacy of our present airport supply.** Because of this, major misjudgments in demand could find the Bay Region far short or over-built for meeting future public requirements.

If a common fault could be found with past attempts by airport owners, the airline industry, and the federal government to project demand, it has been to overestimate air cargo and underestimate air passenger travel. In defense, it can also be said that no-one failed to sense how large the passenger markets might become; rather, the error was in judging <u>when</u> that might happen.

When considering approval actions, financing, design, and construction, the lead-time necessary to create additional airport facilities can vary from three years for small projects to eight to ten years for major additions or new airport sites. These long lead-times make the forecast a very important part of the study effort.

REPORT SUMMARY

The report provides a review of past air travel in and out of the Bay Region and a projection for the years 1975, 1980, and 1985 for the following:

- air passengers
- air cargo
- air mail
- general aviation ownership
- commercial and general aviation aircraft activity levels

The process used is fully documented and can be reproduced with data readily available. But, perhaps more important, the process can be checked against actual experience and, where it might fail to reflect that experience, can be reviewed in detail to identify the specific fault.

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* Prepared for the Regional Airport Systems Study Committee November 5, 1971

** The other is airport capacity.

The process for projecting air passengers began with the past trends in air travel demand. It identified population, per capita income, and total employment as the factors that have had the most significant relationship to air passengers in the Bay Region during the ten-year period 1959-1968. The process then used population and employment forecasts made for the Region by the Bay Area Transportation Study Commission (BATSC), plus an income projection by the contractor. These were combined to form the projection of passengers for 1975, 1980, and 1985 for 98 different zones in the Region.

A similar process for air cargo was utilized which used employment, income, and the cost of air cargo service.

The number of flights required to carry the projected passengers was estimated based upon the proportion of each type of aircraft. The aircraft load factors varied among markets 20% - 70%, depending upon the external market being served.

Finally, the analysis of general aviation found no factors which had historically influenced growth. Instead, it identified the "truth" that where there are airports, there are airplane owners; where there are no airports, there are few owners. A prediction was made using the existing airport availability. In addition, an estimating procedure was developed which may be able to predict how the provision of a new airport may stimulate additional aircraft ownership.

ASSUMPTIONS

A forecast process that tries to systematically identify factors that cause air travel (or any other activity, for that matter) and then attempts to forecast what those individual factors will do, necessarily depends upon an interlocking series of assumptions:

+ 1. The population and employment projections made by BATSC for the Bay Region are valid.

+ 2. The income projections made by Systems Analysis and Research Corp. are valid.

3. The historical relationship between air passengers and population, income, and employment will also be valid for the period through 1985.

4. The destination points outside the Bay Region will continue to generate and receive about the same proportion of travel as at present.

+ Refer to Appendix B for revised projections.

5. The proportion of connecting traffic will remain at about 15% of the total Bay Region traffic.

6. A business recession will affect passenger growth through 1975.

7. Personal travel will increase based upon discretionary income and leisure time.

8. Airport congestion will have some negative effect until 1975.

9. There will be no significant competition with air travel by trains before 1985.

10. Much more non-stop service from the Bay Area will be available in the future.

11. Until 1985, the stimulation of new air travel due to new technology will be minimal.

ISSUES

1. In view of the recent concern for the environment, is the 1965-67 BATSC population forecast of 7.5 million people in the nine counties by 1990 still valid? Recent population forecasts released by the California Dept. of Finance (DOF) show a significant difference from ours:

COUNTY	U.S. Census 1970 (000)	DOF 1975	DOF 1980	DOF 1985	RASS 1975	RASS 1980	RASS 1985
Alameda	1073	1130	1206	1289	1293	1420	1548
Contra Costa	558	614	686	772	705	822	949
Marin	206	227	259	296	255	308	358
Napa	79	88	102	124	86	104	122
San Francisco	716	698	708	714	789	807	817
San Mateo	556	582	613	645	670	738	831
Santa Clara	1065	1216	1384	1572	1204	1435	1606
Solano	170	177	199	239	232	307	311
Sonoma	205	234	275	320	238	281	324
TOTAL	4628	4962*	5432*	5970*	5472	6222	6866

* Does not include 50,000 military personnel

2. The most recent Federal Aviation Administration forecasts for 1971 to 1980 indicate an average domestic passenger growth rate of 12%, which is very similar to the RASS projection.

3. The airline industry has suffered several years of reduced growth rate and declining traffic. While their unpublished forecast for the Bay Area in 1969 generally agreed with ours, a recent reappraisal by the industry will probably be lower.

4. Recent work by William Goldner at the University of California produced another forecast of income for the Region. This newer forecast is different for several counties from that shown by SARC.

5. The new generation has more discretionary income and time, marries later (or not at all), has fewer children, and has less "fear" of flying. Can historical extrapolations still be valid?

6. The effect on passenger travel of a reduction in population growth may be in part offset by the additive effects of employment and income. While the population of the Region in 1970 is 1.8 times that of 1950, the number of air passengers has increased 10 times during that time period. This indicates that air passenger growth is affected to a much greater extent by income and employment than by population alone, as is reflected in the equation used in the forecast report. Recent predictions of a reduction in population growth rate in the future do not necessarily assume a corresponding reduction in per capita employment or income.

San Francisco Bay Area

	Population	Total Air Passengers	Passengers/1000 Population
1950	2,681,322	2,000,000	746
1960	3,638,939	5,000,000	1380
1970	4,628,000	20,000,000	4320

7. The forecast predicts that a larger amount than the current 50% of cargo will be carried on all-cargo flights by 1985. Because of the high cargo capability of passenger aircraft, however, all-cargo flights may be a lower proportion than that predicted.

8. Load factors for passenger aircraft may improve in the future from the current 50% level. If so, the number of annual operations will be reduced.

COMMERCIAL AVIATION PASSENGER FORECASTING*

TECHNICAL MEMORANDUM

INTRODUCTION

Predicting the number of passengers who will want to use Bay Area airports in the future is a first step in the formation of an airport systems plan. Because of the long lead-times necessary for airport development, it is essential to the planning process to find as dependable a means for doing so as possible. Yet, any method, used to arrive at such a basic and important planning consideration, is highly fallible. For this reason, it is necessary to understand the method that was used in the Regional Airport Systems Study and to be aware of the limits and terms of its application.

This paper follows the development of the forecast equation by the contractor, Systems Analysis and Research Corp., and discusses its assumptions and bases. It then uses the equation to analyze the effects of alternate inputs for population, employment, and income in response to more current evaluations of their values, and indicates what these effects may mean for a Bay Area aviation plan.

ARRIVING AT A FORMULA

A forecasting methodology must take into consideration the great number of factors which determine the level of air traffic demand, combine the effects of these various factors, and give relative weights to their influence. This was done in this study by looking at available data and determining historical relationships. Informed judgment plays an important role in this determination, for there are many factors affecting demand for which direct statistical correlation is impossible to evaluate: the economic level of areas outside the Region, tourism and markets, access availability and ease, capacity limitations, service levels and quality.

If the formula arrived at is to be valid for future projections, it must reflect probable changes in future conditions and trends. Therefore, adjustment factors for each of the target years - 1975, 1980, and 1985 - were incorporated into it. These adjustments were derived from a number of very predictive assumptions. The following areas, in which assumptions were made for inclusion in the equation, indicate the complexity of the problem and the extent of possible error:

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* Prepared for the Regional Airport Systems Study Committee February 17, 1972

- national and international economy
- national air traffic growth patterns
- number and location of markets
- tourism
- technological development of aviation; aircraft types and mix
- competing modes of transportation
- air travel cost and quality
- access and capacity
- flying patterns; percentage of business travel, origin and destination from home or work
- spending patterns and the use of discretionary income and leisure time

The question which then remains is whether, even as adjusted, the historical extrapolations are valid and the formula is capable of prediction within a meaningful range.

THE INDEPENDENT VARIABLES

The equation as finally formulated has three independent variables: population, employment, and income.*

Population is an important factor for determining the traffic generating capability of an area, and also for deflating the other independent variables. Income measures the economic ability of residents to use air service, while employment indicates high "employment areas" from and to which business travel is likely to occur. (Business travellers currently make up at least 50% of the total airline passenger traffic enplaned and deplaned at Bay Area airports.)

As Aviation Forecast points out, "Independent variables used in the correlation equation are of little value for projection purposes if the future values of these variables cannot themselves be accurately forecast." As the three most single important indicators of air passenger growth, the nature of the Bay Area's population, employment, and income is very significant. Estimations of their values must be as reliable as possible.

THE SENSITIVITY RUNS

In the past, population growth has been found to follow fairly well-definable trend lines, as have long-term economic growth conditions. Future extrapolation, however, is complicated by factors not applicable to any great extent before. Primary among these is the growing concern

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* While population, employment, and income are treated here as "independent" variables, it is highly probable that they themselves are related, although we do not know just how.

with environmental quality and the resulting desire for population growth control. It is possible that personal preferences concerning population size will decidedly influence future growth rates. Many people feel also that it is no longer sufficient to merely predict growth patterns; trends must now be consciously guided by policy decisions and implementation. Similarly, the distribution of the population, the location of residential and employment centers, recreation areas, and open space are seen to be subject to specific determination. Thus, future patterns will possibly, although not certainly, change to an extent that could mean substantial alterations in any present forecasts.

For this reason, it is necessary to anticipate the possible variations in population, employment, and income, and apply them to the forecast model in order to perceive their effects on air passenger growth. The original application of the model used population and employment figures computed by the Bay Area Transportation Study Commission (BATSC) in 1965, and income figures estimated by the contractor. The more recent 1970 census, and the revisions of population forecasts for the Bay Area made by the State of California Department of Finance imply that changes are indeed occurring. Testimony received at its public hearings by the Regional Airport Systems Study Committee from many different sources, including the Air Transport Association, also indicated opinions of a trend toward less growth in the Bay Area than the original evaluation.

Therefore, a number of sensitivity runs for 1985 were done with different combinations of the independent variables. One important consideration to keep in mind is that "improvement in the quality of life" generally implies a decrease in population growth, but not necessarily a corresponding decrease or slowing of economic activity. Calculations were, therefore, also done where population decreased but per capita employment and/or income increased. Since the forecast equation weighs income relatively heavily, the results where its value is high are particularly interesting.

Twenty-two initial calculations were completed for 1985. Some included combinations of the variables which are not too likely to occur, but which are useful as outer limits against which to compare: 95.5 million annual passengers was the upper limit achieved and 57.9 million the lower. The original estimate arrived at and used throughout the study's contract work was 83.5 million.

The following table summarizes some of the calculations run and compares them with the original base run forecast for 1985.*

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* See Appendix B for details of the forecast equation and calculations.

TABLE I

Brief Comparisons

Using BATSC Population and:

- An increase of per capita employment and income by 5% =
  Increase of total annual passengers by 6.1 million

- A decrease of per capita employment and income by 10% =
  Decrease of total annual passengers by 12 million

Using Dept. of Finance Population and:

- No change in per capita employment and income =
  Decrease of total annual passengers by 11 million

- A slight decrease in per capita employment and income (less than 5%) =
  Decrease of total annual passengers by 14.8 million

- A slight decrease in per capita employment (less than 5%) and an increase in per capita income by 10-15% =
  Increase of total annual passengers by 2.7 million

Using 1970 Census Population (zero population growth) and:

- No change in per capita employment and income =
  Decrease of total passengers by 25.6 million

- An increase in per capita employment and income by approximately 30% =
  Increase of total annual passengers by 12 million

It was assumed by the contractor in the projection of the original income figures used in the base run that there will, in the future, be a long-term trend toward normalization; that is, income levels of the lower income groups will grow at a faster rate than income levels of the higher income groups. The extent to which this does in fact occur will have considerable effect upon passenger growth. If per capita income increases and also is redistributed so that more people have more discretionary income and, concurrently, leisure time, more people will be likely to fly. The sensitivity runs which reflect higher per capita income do not necessarily reflect this possible redistribution, making it possible that their products are low.

The results of the calculations indicate that population growth control is in itself insufficient for controlling air passenger growth. Per capita employment and income are weighed relatively heavily in the forecasting equation. Questions surrounding economic development and the meaning of "quality of life" will also have to be resolved.

Given the uncertainties of the formula itself, as well as those of its independent variables, of what value is such forecasting? The calculations range from 57.9 million to 95.5 million annual passengers, with numerous intermediate variations. When it is considered that 1970 enplanements and deplanements were approximately 1.6 million for San Jose Municipal Airport, 2 million for Oakland International Airport, and 14 million for San Francisco International Airport, the differences between these products are seen to be quite significant in terms of airport systems planning.

The Air Transport Association report* discusses this problem and concludes as follows:

> Confidence levels in these forecasts should be related to probable time bands, rather than to the traffic percentage ranges as of a particular time usually used. This way of viewing the confidence range in the forecast is prompted by the long lead-times in airport planning and the rapid rates of growth in air traffic. For example, if two domestic passenger traffic forecasts were to differ by 20% for 1985 - an apparently large disagreement - the actual difference with traffic growing 10% annually, would be that the higher forecast would project a particular level of traffic that would be attained in 1984, while the lower one would expect the same level in 1986. In an airport's long-range planning for expansion, such a variation would be a matter of fine-tuning the timing of later development phases. As a practical matter, this would be done anyway, based on actual experience accumulated during the course of the next decade.

This "sliding time scale" approach seems to be a practical means of handling the uncertainties of prediction. Within the scope of a regional systems plan, the possible time variation may well be more than a case of two years and "fine-tuning" adjustment. This is more a matter of degree than basic approach, however. While long lead-time is essential, incremental development of facilities allows for the re-evaluation and revision of plans as factual data replaces some of the problems of long-term projection.

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* A.T.A. Airline Airport Demand Forecasts, San Francisco/Oakland Report, pages 5-6.

ACCESS

The access sub-study dealt in detail with available and planned access facilities and with the different travel modes which are or could be used in airport access. Data was collected concerning the origins and destinations of passengers, the travel distances which are necessary, the choice of ground travel mode, and the decisions which passengers in the various areas of the Bay Region would make if they had free choice of which airport to use.

Allocation

The Committee found that the allocation of passengers among airports is an integral part of the ground access question. Allocation of passengers depends on two factors: 1) the airline service at each airport and 2) the accessibility of each airport. Passengers tend to choose the airport site which is closest (in distance or time) to them, and will not utilize remote airports unless they are the only locations where particular flights are available. This means that if an airport location is too removed in the passenger's view, then the passenger must be compelled, through service scheduling, to use it in order to fulfill its capacity, If this were not done, remote airports would lie largely unused and the sites located close to the urban centers would have too great a demand placed on their capacity.

The Committee had to consider the question of passenger convenience in deciding whether or not to locate airports so that "compelled" utilization would be necessary. It also had to determine whether such airline scheduling was possible.

Civil Aeronautics Board

The Study Committee met several times with the Civil Aeronautics Board in connection with the scheduling problem. At these meetings, the Committee was told that while the CAB does have the statutory power to certificate certain airlines to serve certain airports, it has historically granted service to the Bay Area (all three airports) as one service point. Only recently has it issued certificates specifically designating which of the three airports in the Region are to be served. Further, the Board cannot compel a carrier to serve an airport in a certain way if the carrier has been granted open rights at all airports.

Once certification is granted, it can be altered or amended only through a judicial process, meaning that the outcome cannot be determined before the long hearing process is finished. The Committee was therefore assured of no definite help if it decided on an airport alternative which included sites not easily accessible and not readily chosen by the air passengers.

Environment and Economics

Access raises not only technical questions, but also economic and environmental questions of prime importance. Outlying sites could impose on the Region's air travellers extra travel costs in time and money. Construction of rapid transit to remote sites would be less likely than construction to closer locations because of the extremely high cost (approximately $20 million per mile). That means that the automobile would be the prime access mode, and this would add tons of pollutants per day to the atmosphere. Emissions from automobiles going to and from the airports are a major part (about one-third) of aviation-related air pollution.

Decisions

All of these problems, then, had to be considered: travel times, costs, passenger convenience, air service scheduling, the relationship of access and capacity, and the tradeoffs between access and environmental quality. The conflicts here were often substantial. At the same time, a great misjudgment in this area would mean the possibility of over- or under-utilization of airports and a resulting airport system which was neither convenient nor functional.

CAPACITY

The adequacy of an airport system depends on the ability of its airport and airspace capacity to meet aviation demand. A detailed analysis of capacity was therefore undertaken early in the study to provide a picture of needed facilities.

Capacity Measurement

Hourly capacities of facilities can be determined fairly easily. Overall, or annual capacities introduce uncertainties because of the many factors which must be taken into account: possible operating procedures, conflicts among airports, peak times and delays, air traffic control. The uncertainty is especially true in attempting to determine the capacities of proposed airport systems.

Capacity Requirements

The more difficult problem, however, is deciding what capacity will be needed in addition to that at hand. This is done by translating the demand forecast - numbers of passengers and tons of cargo - into numbers of operations. Included in this translation are the factors of aircraft mix (the sizes and carrying capabilities of aircraft used) and aircraft occupancy (the extent to which the aircraft used are "filled"). Smaller planes and low occupancy, for example, will mean a greater number of necessary operations, and a greater burden on the capacity of the system.

In the capacity reports, the original aviation forecasts were used. In addition, a low figure for passenger seat factor was assumed (47% occupancy). As discussed earlier, the aviation forecast was revised. Similarly, the validity of the seat factor was challenged at the public hearings. People expressed a strong interest in seeing a more efficient use of aircraft, which would mean a reduced need for airport and airspace capacity and therefore less airport development.

Seat Factor

The Committee worked with the concept of the "airport utilization factor" as a possible method for measuring efficient utilization of aircraft and, consequently, airports. (See the following issue papers for explanation of this concept.) It chose, however, seat factor (the average number of seats occupied divided by the number of seats available) as the best indicator of efficient use, and adopted a 60% average aircraft seat factor figure.* Recalculation of needed capacities from the new demand figures

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* Refer to Appendix B for more detailed information about seat factor and numbers of operations.

and the new seat factor produced a substantially lower number of required aircraft operations. It was also assumed that only 60% of the cargo by 1985 would be carried on all-cargo flights (rather than the 85% assumed by the contractor), requiring fewer all-cargo aircraft. Combined with the larger aircraft coming into use, this improved utilization allows a 3½ times growth in air passengers with only a 2-fold increase in aircraft operations. While there is no direct means of requiring airlines to achieve the 60% seat factor figure, facilities will not be available for the larger number of operations which a lower seat factor would necessitate.

AIRPORT ACCESS*

ASSUMPTIONS/ISSUES PAPER

INTRODUCTION

As the time of air travel to distant points has decreased in the "Jet Age," the proportion of the total trip time devoted to ground travel to and from the airport has increased - increased to the extent that it has become a major concern to the traveling public.

As we attempt to foresee the future aviation demand in the Bay Region and the accompanying airport capacity requirements, we must look at the ability of our ground transportation systems to service the air capacity. In doing this, a major concept comes into focus: ground accessibility together with airline service level determine how air travel passenger demand is allocated from zones of origin or destination to specific airports.

The purpose of this paper is to look at the many implications of this accessibility/allocation concept, and to discuss the assumptions and issues which must be carefully considered by the Committee in its decision-making process.

REPORT SUMMARY

With the assistance of the transportation agencies in the Bay Area, a ground access network of the principal highway and transit routes that connect each of the 98 forecast zones to the airport alternatives being considered was developed. (This process would also allow additional alternatives which the Committee may identify to be connected.) Passengers were allocated over the transportation system from their zone of origin or destination to the nearest airport via the minimum cost path.

This process often placed more passengers at an airport than could be accommodated according to the airport capacity estimates made for the RASS Committee by R. Dixon Speas and Associates.** When this occurred, a further analysis was made that indicated how the airline service would have to be restricted at particular airports in order to force passengers to make their choice of airport, not on the basis of accessibility alone, but also on the service available. This process suggested how new airport capacity might be effectively utilized to prevent overloading at other airports

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* Prepared for the Regional Airport Systems Study Committee November 5, 1971.

** See Chart 1.

In addition, the airport access road capacity necessary to service the airport capacity was analyzed, as were airport parking requirements.

It should be noted that there are two reports which comprise this portion of the study - one done in Phase I and the other in Phase II as a supplement to investigate the additional airport alternatives being considered by the RASS Committee. The two reports discuss work, airport business, and cargo truck trips made to airports as well as passenger trips. General aviation access was also included.

ASSUMPTIONS

In the ground access work, we are dealing with a fifteen year projection into the future. To do so requires a sizeable number of assumptions, some of which are easily accepted based upon our personal experience with access problems. Others will be debatable. Because the actual process of passenger allocation depends upon these assumptions, they should be carefully reviewed and understood.

+1. This access work uses the 1985 demand forecast made by Systems Analysis and Research Corporation in 1969/70.

2. When airline service is equivalent, an air passenger will choose an airport based upon the minimum time/cost route from where he is to where he wants to go.

3. There is a difference between "demand" and "travel." Demand is always there, while travel only occurs when service is provided, and varies according to the level of service.

4. The major highway and transit routings to and from the airports will have adequate capacity in 1985 and so will not be a constraining factor.

+5. By 1985, 95% of the passengers will have a choice of airport, with only 5% restricted by airline service patterns.

6. BART will be extended directly to each major airport site:
   to Oakland 1975-80
   to San Francisco 1980-85
   to San Jose by 1985
   There will be bus connections between Oakland and BART and between San Francisco and BART by 1972.

+7. In the selection of transportation mode to the airport, only 13-18% of air passengers will choose transit.

8. A traveller by automobile values his time at $9 an hour, while a transit rider values his time at $8 an hour.

+9. The Southern Crossing will be built by 1985. This assumption was made in 1969 when the Division of Bay Toll Crossings was well into the project, with the design nearly completed. Since then, however, construction is more in question due to the appearance of strong opposition to the plan, and a referendum has been imposed by the State Legislature.

+ Refer to Chapter 1 discussion of Access for revisions.

10. The deficiencies which were identified in capacity of airport access roads and parking will be corrected as necessary so they do not constrain the use of the airport capacity.

11. Helicopter or other special air vehicles are not included in the access considerations.

ISSUES

From what seems like a very mundane subject comes a surprising set of issues, many of which involve action and authority well beyond the RASS Committee.

1. The use of 18% as the maximum proportion of air passengers using transit is based upon experience in other locations in the U.S. and abroad. There are several unique characteristics of our local situation which could significantly alter the proportion of passengers using transit:

   - BART is a new, 75 mile, high speed, comfortable, comprehensive system.

   - While the door-to-airport travel time may favor the automobile, transit's absolute, regular, dependable service at all times of day may prove more attractive to the airport passenger as he deals with airline schedules. Highway use may also restrict airport access or substantially increase ground travel times in the future.

   - 35% of the Bay Region's air passengers represent "California Corridor" traffic. These passengers are more likely to use transit for access because of the short-haul nature of their trips.

   If a higher proportion of passengers than the 18% suggested do choose transit, then direct transit connections will have to be capable of handling this traffic.

2. The ability of the highway systems in the Bay Region to move future traffic demands at reasonable service levels (speeds and delays) is critical to the airport access question. This issue is related to the availability of the Southern Crossing and even more basically to the population of the Region by 1985.

3. Airport sites that are remote from the urban core present a dilemma. A principal reason for the consideration of these new sites is to avoid the urban problems of congestion, lack of space, and negative environmental impact. Yet, our experience at Dulles Airport in Washington D.C. and at other places is that people will use the closest airport unless forced by scheduling to do otherwise.

4. There is only one market today in which passengers have a free choice of airports. In that market, a review of the passenger distribution among the Bay Area airports is somewhat different from what our 95% choice distribution would imply.

5. The use of airline service points and scheduling patterns to effectively utilize capacity is not a new concept. The actual accomplishment of that process, through the coordinative efforts of a committee such as RASSC, the Civil Aeronautics Board, the Public Utilities Commission, and the airlines, is. This question is usually set aside by a study group as being outside its field of responsibility.

6. The actual application of the allocation process presented in the access work will lead the Committee to allocate passenger activity to specific airport alternatives. These allocations may conflict with local airport plans.

7. Generally, in the provision of airline service, passengers have come to the aircraft, rather than the aircraft to the passengers. That is no longer true in the "California Corridor" market, where expanded airline service has come to more airports. We are saying that an even larger proportion of passengers will have a choice of airport in the future (up to 95% of the passengers by 1985). This may directly conflict with what the airlines might prefer.

8. Given the factors discussed in numbers 5, 6, and 7, then, how can it be assured for any chosen airport alternative that the passenger allocation process will provide utilization of that alternative's capacity?

9. Is there a minimum airport size for which transit connections should be assured?

10. Within the constraints of safety and financial feasibility, should service to the public take precedence over the convenience of airlines in determining the allocation of passengers among airports?

11. How should capital cost of highway and transit extensions which serve an airport be allocated?

12. Should a given accessibility to a general aviation airport be assured for all urban and rural portions of the Region?

13. Highway capacity must be available to accommodate mail and air cargo for future airports.

DEMAND VERSUS CAPACITY FOR 95 PERCENT CHOICE ALLOCATION

(DEMAND AND CAPACITY SHOWN IN MILLIONS OF ANNUAL AIR PASSENGERS)

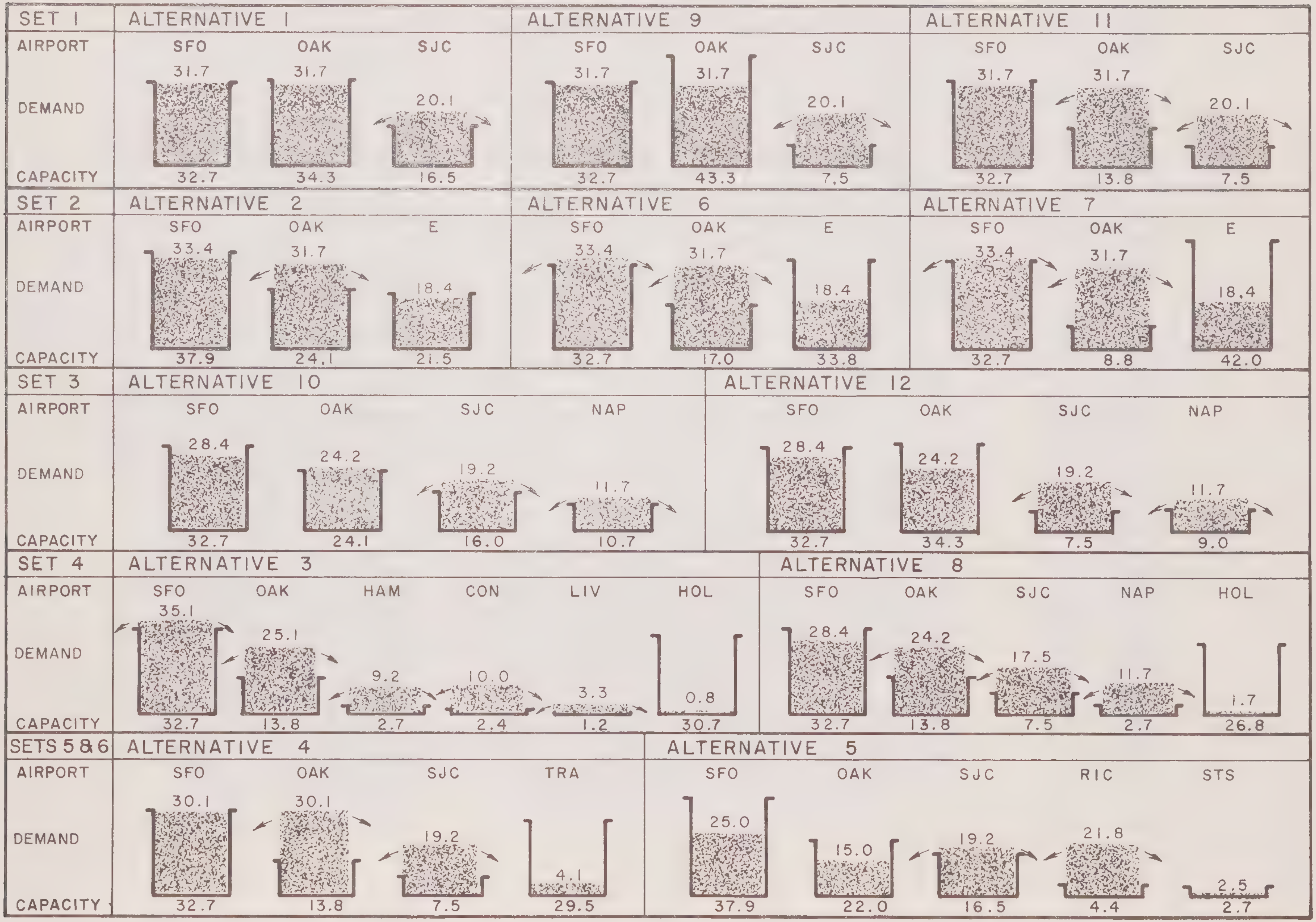

Chart I

AIRPORT AND AIRSPACE CAPACITY*

ASSUMPTIONS/ISSUES PAPER

INTRODUCTION

A previous issue paper described the forecast work as one of two principal factors which will be used to judge the adequacy of our present airports. This paper is about the other factor - capacity. Starting in the early 1960's, there has been an increasing concern about the ability of our major air terminal areas to accommodate aviation growth. Delays due to peak air traffic demands have caused congestion and hence concern about the sufficiency of capacity at New York, Washington D.C., Chicago, and Los Angeles. San Francisco, by comparison, has had minor problems to date. It is the concern about future demand, based upon the experience of these other locations, that brings the capacity subject into a major position in this study.

REPORT SUMMARY

Two capacity analyses were done - one for airport runway capacity, the other for airspace capacity.

Airport capacity analysis techniques used in the report were developed for the Federal Aviation Administration in the mid-1960's by the Regional Airport Systems Study contractor. The analysis procedure has been validated against actual airport operations, and provides a relatively quick way to forecast the capability of airports in terms of an hourly and a yearly capacity.

Two processes were used in the study in the analysis of airspace capacity. One is a fast-time computersimulation and the other is a real-time simulation technique. The fast-time simulation was used by the RASS contractor.

This computer technique is fast, relatively inexpensive, and can be quickly recycled to test new alternatives. The real-time process was done for the Bay Area by the Federal Aviation Administration, at the request of the RASSC.** It does not rely upon assumptions and therefore more realistically represents actual controller/pilot/aircraft performance. It does take time to accomplish and is expensive.

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* Prepared for the Regional Airport Systems Study Committee December 1971.

** A Dynamic Simulation Study of Air Traffic Capacity in the San Francisco Bay Terminal Area, Department of Transportation, Federal Aviation Administration, National Aviation Facilities Experimental Center, August 1971.

Airport Capacity

The report describes the detail of the input information used at each airport and applies a capacity estimating technique. Airport runway capacities are then developed for:

1) The existing general aviation airport runway systems
2) The publicly owned general aviation airports fully developed according to presently adopted master plans
3) San Francisco, Oakland, and San Jose airports according to their existing runway systems
4) San Francisco airport with one additional runway; Oakland Airport with one, two, and three additional runways
5) New major airline airports at Agnew/Alviso (Site E) and Hollister
6) Joint use civil/military airports at Hamilton AFB and Travis AFB
7) STOL operations in San Francisco (at China Basin), Richmond (Point Isabel), and at the San Carlos, Concord, and Livermore Airports

Measures of Aircraft Capacity

The capacity of an airport's runways to accommodate aircraft is expressed on both an hourly basis (Practical Hourly Capacity - PHOCAP) and an annual basis (Practical Annual Capacity - PANCAP).* The annual capacity value is based upon specific hourly and daily variations. If, for example, the peak hour rate of 74 operations per hour for San Francisco Airport were sustained for 24 hours per day, 365 days per year, San Francisco Airport could theoretically accommodate 650,000 annual operations instead of the 370,300 shown in the report. The 370,300 reflects the fact that the actual operations respond to the hourly, daily, and seasonal variations in the public's demand for air travel services.

Based on our experience with other transportation problems, however, we know that travellers will eventually respond to the delays that occur during peak traffic periods by redistributing their time of travel. Though it is unlikely that full redistribution will occur, adjustments of passenger demand and airline scheduling can change the annual use. Consequently, annual capacity values should not be taken as absolutely fixed values.

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* It should be noted that capacities developed in the Phase I capacity report have been revised in Phase II to reflect the change in FAA air traffic spacing procedures for smaller aircraft following large jets. The spacing distance requirement changed from a 3 mile separation to a 5 mile, due to wake turbulence.

Measures of Passenger Capacity

By converting the annual runway aircraft capacity of an airport into an annual passenger capacity, we add two additional variables - size of aircraft in the traffic mix, and the passenger load factor. By changing the percentage of large aircraft in the mix, and/or changing the load factors, we can cause great differences in the number of passengers that 370,300 annual operations can produce. By combining the variability of annual operations, aircraft mix, and load factor, the number of passengers that theoretically can be accommodated varies over a wide range.

General aviation airport capacity, as depicted by proposed airport development plans, would nearly equal the demand of 11 million annual operations projected for 1985, <u>if</u> there were a redistribution of demand to some of the outlying airports and <u>if</u> some of the airports that are now privately owned remain available for public use. Again, hourly capacity values and therefore annual operations may increase as the peak traffic periods and delay levels redistribute.

Airspace Capacity

The work done by both the RASSC contractor and the FAA identifies a negative impact of larger operations at Oakland International Airport upon the Naval Air Station, Alameda.

The airspace work done by the RASSC contractor would indicate an airspace conflict in the South Bay area if each of the existing airports was to expand to a maximum size. The FAA work avoids this conflict with San Jose departures by assuming two-segment approach procedures into Oakland and San Jose Airports. With the capability of "Area Navigation"** and two-segment glide slope, it appears that airspace capacity would not be a limiting factor to future demand. It should be noted, however, that this would:

1) require positively controlled airspace in at least the central portion of the Bay
2) virtually remove or limit the IFR capability of general aviation airports located in the central Bay Area
3) have a limiting effect upon military airport capacity at Alameda and Moffett
4) have some implications with respect to overflight noise in the Bay Region

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* A separate "issue paper" on general aviation discusses this matter further.

** Would not require flight paths over specific ground navigation facilities, but would rather allow free choice of aircraft routings.

ASSUMPTIONS

The following assumptions were used in the capacity work. These should be carefully reviewed by the Regional Airport Systems Study Committee.

1. The future pattern of runway usage will remain the same as the current pattern.

2. "Area Navigation" in terminal areas will be in use by 1985.

3. Two-segment glide slope capability <u>was not</u> assumed by the RASSC contractor and <u>was</u> by the FAA analysis.

4. Service levels of 4 minutes average delay for airline aircraft departures (varying from about 0-20 minutes) and 2 minutes for general aviation aircraft departures are reasonable service levels.

+5. An airport with 747 type aircraft in its traffic mix will have about 77 passengers per aircraft operation and those without the large aircraft will have about 64 passengers per operation. *

6. At airports where airline and general aviation share the same runways, airline use is given precedence.

7. General aviation airport future capacity was based upon the development shown on their current master plans.

ISSUES

From these assumptions and findings come the following issues:

1. Can airline air traffic be given precedence over military and other civilian traffic when conflicts in airspace use occur?

2. Will the new technology represented by area navigation and two-segment approach slopes be available by 1985?

3. a) Should a control of peak-hour scheduling and a more uniform utilization during the hours and days of the week be established?
   b) Should such scheduling be at the discretion of each airline, or will some larger control and enforcement be necessary? If the latter, who should do it and how?

4. Should load factor criteria be established to measure the need for new facilities? Who shall insure implementation and how?

5. Which has precedence - capacity or noise abatement?

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* These numbers reflect the aircraft mix shown in the <u>Forecast</u> report, an average load factor of about 50%, and an allowance for non-passenger-carrying, training, positioning, and all-cargo flights.

+ Refer to Appendix B for revisions.

6. Can both capacity and noise abatement problems be at least partly solved by the reduced number of aircraft operations resulting from more efficient use of aircraft and airports? Again, who can control this use?

7. Can peak-hour general aviation training flights be diverted to other areas?

8. Will airline and general aviation instrument training flights still be able to use Bay Area airports in the future?

9. Should airspace used for general aviation VFR training be reserved?

10. How extensive will the future FAA-designated positive Terminal Control Areas be in the Bay Area?

11. Should military flights have to comply with the same capacity and noise abatement procedures as the civilian traffic? Can this be assured?

12. Does STOL offer enough potential benefits to warrant the airspace constraints it would put on other areas?

13. In 1969, prior to the recent slump in airline business, peak hour demand at San Francisco Airport was approaching the hourly capacity numbers. Significant delays were occurring during some peak periods. The respite to capacity problems offered by the economic downturn could be lost in the near future. How should the airports, airlines, FAA, regulatory agencies, and ABAG interact to assure full and equitable use of that capacity?

A MEASURE OF EFFICIENT USE OF AVIATION FACILITIES *

ASSUMPTIONS/ISSUES PAPER

INTRODUCTION

A more efficient use of aircraft and airports is one possible solution to the problem of increasing demand for aviation services. Because spatial, environmental, and financial resources are limited, demonstrating optimal use of airport facilities is a necessity. One possible measure of optimal airport use is some measure of the utilization of the total seats available.

The desire to see better utilization of aircraft before new aviation facilities are considered was expressed in testimony to the Regional Airport Systems Study Committee at its public hearings. This input has prompted the RASSC to consider a "load factor" ** criterion which can be used in determining future aviation requirements for the Region and could be applied in the future to measure the need for new facilities.

SUMMARY AND ORIENTATION

The number of variables which must be included make the definition of a "reasonable" load factor difficult. Some of these are:

1. Market differences - There is wide variation among markets being served by the Bay Region airports. For example, the largest market, Southern California, has a Bay Area load factor of about 55%, *** while the load factor for other markets may be as low as 20%.

2. Competition - Airlines competing with one another on the same routes and schedules often cause low load factors. Hawaii, although the fifth largest Bay Region market, has a relatively low load factor of 40%, due in part to the competition of the four airlines servicing it. For example, on six days of the week, four planes leave the Bay Region for Hawaii within fifteen minutes of each other.

SFO-Honolulu:	8:45 a.m.	707 with 120 seats
SFO-Honolulu:	8:50 a.m.	720 with 88 seats
SFO-Honolulu:	9:00 a.m.	747 with 350 seats
SJC/OAK-Honolulu:	9:00 a.m.	707-320 with 142 seats
		TOTAL of 700 seats

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* Prepared for the Regional Airport Systems Study Committee, April 4, 1972

** Load factor is defined by the regulatory agencies as "the number of passenger miles as a percent of the number of seat miles, in revenue service" (California PUC Glossary of Terms, November 1, 1971)

*** California PUC form 1504.23

****Official Airline Guide, October 15, 1971

3. Passenger service - Airline service to a given market must be frequent enough to assure a reasonable level of service to passengers. This again may account for low load factors even in relatively large markets. There may be enough passengers to warrant frequent flights throughout the day, but not, perhaps, enough to fill each flight.

4. Demand variation - There are hourly, daily, and seasonal variations in passenger demand for air travel services - for example, Saturdays are low travel days. While adjustments in schedules are made, fluctuations in load factor still do occur. *

5. Aircraft mix - The introduction of larger aircraft results in reduced load factors for a certain period of time until traffic demand rises to meet the increased capacity. This can be seen in the load factor fluctuations for the total U.S. industry: **

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
L.F.	59.3	55.4	53.0	53.1	55.0	55.2	58.0	56.5	52.6	50.0	49.7

(Introduction of jets) (DC-8, 727, & 737)

6. Break-even load factor - Passenger service and competition factors must be balanced with the necessity of the airline to benefit financially. Too-low load factors may not pay for the operation of the aircraft. Current break-even load factor would be in the order of 40%.

7. New service - The introduction of new service will often experience low initial load factor until the market is developed. For example, National Airlines service between SFO and Atlanta currently has a load factor of 15-18%. ***

The RASSC has been helped in defining a load factor figure by the recent decision of the CAB to require of airlines a 55% load factor before fare increases will be granted. This standard was, in the words of the CAB, "designed to discourage excessive schedules and was based in part on the environmental considerations of airport congestion and air and noise pollution." **** It will also, as pointed out in Aviation Week and Space Technology" (page 28, 4/19/71), " give airline management an added incentive to both reduce schedules unilaterally and to expedite collective capacity control action under the Board's authority."

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* An example of a possible remedy to this problem is given in the March 27, 1972 "Aviation Week & Space Technology": "What the carriers are learning is that the 747 is a profitable peak-hour plane in a high-density market, but highly inflexible in a frequency battle. The solution is in schedule adaptation-using the 747 in the peaks and scheduling smaller aircraft for off-peak frequencies in the market-share game.

** ATA, Air Transport 1971

*** "Aviation Week and Space Technology," January 31, 1972, page 30

**** "Aviation Week and Space Technology," January 20, 1972, page 112

Although this standard has been set by the CAB as a guideline for fare increases, there is, at this time, no concrete assurance from any regulatory agency that certain load factor regulations will be absolutely mandatory for all airlines.

PROBLEMS WITH LOAD FACTOR AS A MEASUREMENT OF AIRPORT EFFICIENCY

Several things occur when airport statistics are used to generate load factor ratios for airports:

- if flight schedules are used to generate the number of seats available, then non-scheduled and cancelled flights are missed.

- if an airport (such as San Jose) has a significant amount of through plane service, then not all of the seats are available for that airport's passengers

- positioning flights * will cause low load factors

Because of the problems, it is suggested that an "airport utilization factor" be considered as a criterion. This factor would simply state the passengers enplaned and deplaned per airline operation at each airport. Intrinsic in the factor would be the following:

- load factor
- positioning flights
- all-cargo operations
- training operations
- size of aircraft in the mix
- amount of through plane service
- airline competition
- service available to the public

The "airport utilization factor" for the Bay Area has been forecasted by Systems Analysis and Research Corp. to be:

1975 - airport utilization factor of 61 passengers per operation **
1980 - " " " " 71 " " "
1985 - " " " " 77 " " "

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* Scheduled flights run primarily to reposition an aircraft for a later

** If 747 size aircraft are not in the mix, this number becomes 64 passengers per operation.

Currently at the three airports we are doing:

Airport	Year	Airport Utilization Factor (passengers/operation)
SFO	1970	45
OAK	1969	28
SJC	1969	28

In order to achieve the forecast levels, some of the things affecting the airport utilization factor will need to change. The obvious ones currently changing are the introduction of aircraft with increased size (and fewer operations) and improved load factors.

This criteria could allow for an overall "efficient" airport use even though two airports had different airport utilization factors. Also, two airports could have completely different reasons that interact to cause the same numerical value.

The importance of this factor is demonstrated below:

Existing Airports	Speas II Capacity (000)	Passenger Capacity (millions) AUF 64	AUF 77	AUF 85	AUF 90
SFO	370	23.7	28.5	31.4	33.3
OAK	179	10.5	13.8	15.2	16.1
SJC	117	7.5	9.0	9.9	10.5
	TOTAL	41.7	51.3	56.5	59.9

FURTHER ANALYSIS OF AIRPORT UTILIZATION FACTORS *

ASSUMPTIONS/ISSUES PAPER

At its April 7 meeting, the RASSC asked staff to provide further information and analysis of the "airport utilization factor" (auf) as a proposed measurement of airport utilization. Comparisons have therefore been made of various airports' aufs at different time periods. The following chart presents this information for six California airports and six out-of-state airports for the years 1960, 1965, and 1969/70. (See also chart A-1 for passenger and operations statistics from which the aufs are calculated.)

Chart I Airport Utilization Factors
(passengers enplaned or deplaned per airline operation at each airport)

	1960	1965	1969	1970
OAK	6	21		31
SJC	6	11.5		35
SFO	32	41		45
SMF	11.5	18.5		39
SAN	22	38		43
LAX	29	43.5		50
JFK	23	37	38.5	
BOS	23	35.5	41.5	
ORD	35	41.5	44	
IAD	-	27	31	
DCA	17.5	31	44.5	
RNO	12.5	22	31.5	

Notes: SMF=Sacramento, SAN=San Diego, LAX=Los Angeles International, JFK=John F. Kennedy (which was Idlewild in 1960), BOS=Boston, ORD=O'Hare (Chicago), IAD=Dulles (Washington D.C.), DCA=Washington National, RNO=Reno

From Chart I it can be seen that the trend has been steadily increasing aufs over the years from 1960 to 1970. This is largely due to the continuing introduction of larger aircraft - the jets around 1960, stretched DC-8's, 727's, and 737's around 1967-68, and 747's in 1970 - causing a decrease in number of airline operations in proportion to number of passengers. Other factors may also enter into this trend, such as the decrease in number of training and positioning operations as an airport increases in size and requires its capacity for passengers flights. New airline route awards by CAB and PUC are also a factor. It can be seen that the less busy airports have lower auf values. These airports have fewer large aircraft and often have more through plane service.

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* Prepared for the Regional Airport Systems Study Committee, April 20, 1972.

From these figures it is apparent that different auf values will have different causal relationships and must therefore be analyzed as to the reasons as well as by the numerical values themselves. While the numerical values are useful for trends and comparisons and are one useful planning tool, a general understanding of the causes at each airport is also necessary.

An example of the importance of this understanding is illustrated by San Jose Airport. One of the factors composing its auf is seat factor. If a percentage seat factor were estimated for SJC, it would currently be around 30%. If a careful analysis of the through plane service is made, however, we find that many seats are already occupied by through passengers. If we account for this, the actual SJC seat factor would be about 50%. In a case such as this, it is important to analyze not only what variables affect the auf (such as seat factor), but also the nature of the variables themselves. Most important, though, for our regional planning purposes, is that SJC must move from a 35 auf in 1970 toward 64 in 1985 by some combination of these many variables if it is to reach the capability we are assuming for it.

The airport utilization factors for the Bay Area have been forecasted by Systems Analysis and Research Corp. to be:

	with 747 type aircraft in the mix	without 747 type aircraft in the mix
1975	61 pass/oper.	51 pass/oper.
1980	71 " "	59 " "
1985	77 " "	64 " "

If the current aufs at the three major Bay Area airports are compared as a proportion of these planning factors, * then:

Chart 2 Airport Utilization Factor Ratios

	1970 auf	1975 planned auf	1975 ratio	1980 planned auf	1980 ratio	1985 planned auf	1985 ratio
OAK	31	51**	.61	71	.44	77	.40
SJC	35	51	.69	59	.59	64	.55
SFO	45	61	.74	71	.64	77	.59

This comparative index indicates the progress toward the various aufs and I believe can serve as an initial check on utilization. Future changes could cause these ratios to exceed a value of one.

* These have been expressed as a ratio of the 1970 auf to the planning factor. If there were a concern that these factors would be confused with "seat factor," then this ratio could be multiplied by 100 and a constant, say 50, could be added to each to create a numerically different kind of index.

** If has been assumed here that 747's are not in the mix at Oakland until after 1975.

Chart A-1 Annual Passengers (Enplaned & Deplaned) and Operations

		1960	1965	1969	1970
OAK	passengers	334,440	966,636		2,055,180
	operations	52,066	46,484		66,545
SJC	passengers	80,731	126,247		1,595,153
	operations	13,435	10,912		45,499
SFO	passengers	4,637,035	8,706,984		13,867,941
	operations	146,307	210,948		306,520
SMF	passengers	339,657	569,291		1,330,311
	operations	29,085	30,578		34,344
SAN	passengers	878,669	1,632,833		3,341,291
	operations	39,270	42,775		77,609
LAX	passengers	6,605,036	12,578,909		20,780,718
	operations	226,873	288,610		415,719
JFK*	passengers	5,246,822	12,953,298	14,462,886	
	operations	224,155	352,469	376,404	
BOS	passengers	2,769,826	5,364,862	9,032,172	
	operations	120,139	150,452	216,849	
ORD	passengers	4,240,398	18,333,148	27,788,582	
	operations	121,866	433,026	632,030	
IAD	passengers	-	874,758	1,965,280	
	operations	-	32,588	63,412	
DCA	passengers	4,159,528	6,777,762	9,875,936	
	operations	239,464	219,108	221,831	
RNO	passengers	261,122	484,456	787,216	
	operations	20,600	22,078	24,947	

Sources:

For Numbers of Operations: FAA Air Traffic Activity, DOT/FAA
1960 - fiscal year ended June 30, 1960
1965, 69, & 70 - calendar year

Number of operations includes charter, supplemental, non-scheduled, cargo training, and positioning commercial airline operations.

For Number of Passengers: Out-of-state:
1960: Air Commerce Traffic Patterns, FAA, fiscal year
1965 & 1969: Airport Activity Statistics of Certificated Route Air Carriers, CAB & DOT, FAA

For Numbers of Passengers: In-state: data from individual airport activity records, 1960,1965, and 1970 calendar years.

Out-of-state passenger numbers include charter and non-scheduled, but 1965 and 1969 do not include supplemental or intra-state passengers. Intra-state figures are small and therefore not highly significant, but the inclusion of supplemental passengers, while still a small proportion, would raise the number of passengers and cause a slight increase in the a.u.f.'s.

In-state passenger numbers do include supplemental and intra-state, as well as charter and non-scheduled.

Because the numbers of operations for 1960 are for the fiscal year and the numbers of passengers are for the calendar year, there is some discrepancy in the figures, although for this year it is probably not significant.

ENVIRONMENTAL STUDIES

Dramatic technological growth in the twentieth century has often been paralleled by an equally dramatic deterioration of environmental quality. Evidence of such deterioration has become increasingly apparent over the past few years as the cumulative effects of largely unrestrained development are being felt. As a result, there has been increasing public and private concern about the conservation of environmental resources and the maintenance of a liveable level of environmental quality.

The Committee therefore gave major attention to consideration of the relationship between aviation activity and the environment. The impacts which various levels of aviation development have and will have upon air quality, noise levels, and the physical environment were sought, and public response and attitudes were solicited. An integral part of the study, this work led to the adoption of specific decision criteria for noise and air quality which were used in the decision process and which will also serve as guidelines for any future airport developments. The land use report was not formalized into decision criteria, but the study facilitated the identification of environmental factors associated with particular airport proposals, such as open space, parks and recreation areas, Bay fill, and wildlife refuges, and called attention to those areas of probable major concern in each case.

THE EFFECT OF AVIATION ON AIR QUALITY *

ASSUMPTIONS/ISSUES PAPER

INTRODUCTION

Aviation along with its advantages of convenience and efficiency, is also recognized as having environmental problems. Aircraft are often perceived as the source of odorous, soiling, visibility-restricting air pollution. Because this subject of aviation-caused pollution is sensitive and concern with it so high, it is important to develop data which can give a realistic picture of the present and potential situation within a broad regional context, and can thus serve as a basis for informed judgments and decisions. This paper discusses the assumptions and issues surrounding the subject of air quality which must be carefully considered by the Study Committee in its decision-making process.

REPORT SUMMARY

The California State and the Federal governments have established ambient air quality standards for the five contaminants which are associated with aviation-standards which reflect those levels which should not be exceeded in the atmosphere because of possible impairment of public health and comfort. These five contaminants are:

- oxidant (broken down in this study into hydro-carbons or organics, and nitrogen dioxide)
- carbon monoxide
- sulfur dioxide
- nitrogen dioxide
- particulate matter

The study developed and applied methods of identifying the levels of these emissions at Bay Area airports, both at present and for five future conditions, ** and of determining their probable impact on surrounding areas.

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* Prepared for the Regional Airport Systems Study Committee, November 5, 1971.

** - 1975 demand
- 1980 demand
- 1985 demand
- present maximum capacity
- future maximum capacity

Aviation emissions come from five basic sources:

1. aircraft operations - an operation is either a takeoff or a landing, including climbout and approach under 3500'. Above 3500', pollutants are diffused and diluted over an area so large that it is not possible to determine their impact on any specific Bay Region area.

2. engine overhaul and maintenance facilities

3. fuel handling, storage, and transfer

4. jet fuel dumping (up to 1975, after which this practice will probably be discontinued)

5. ground motor vehicles - vehicle activity on the airport, as well as trips made directly between airport locations and the nearest highway or freeway, are considered to be directly aviation-related.

At present, aviation accounts for approximately 1.5% of all air contaminants emitted in the Region. Total emissions of contaminants to the atmosphere in the Region are expected to decline substantially (from 9463 to 3584 tons per day) over the next 15 years, primarily because of automobile exhaust control improvements. The amount attributable to aviation, however, will increase from 138 to 280 tons per day. The net result will be aviation contributing about 8% of the total by 1985.

A study of air pollution impact must be made within the context of the Region's climatological features. Emissions do not remain stable at their source, but are dispersed and transported from it. How and to what extent distribution takes place depends upon such factors as temperature, airflow regimes, inversions, and precipitation.

The nine counties of the San Francisco Bay Region together form an air basin, where control of pollutants required common action on an areawide basis. The shared problem does not, however, imply a uniformity of conditions. The Region is an area of complex climatology, with large differences within it. Some localities, because of their specific features, are thus more sensitive than others to the introduction of air contaminants.

For planning purposes, it is useful to have a general guide which indicates the sensitivity of certain areas. This can be done by rating air pollution potential - the probable reaction of an area to additional emissions. (See Chart 1) This reaction also depends upon the area's existing background pollution situation, since that, too, will affect further tolerance. Such a rating system can be applied to any area which may come under consideration by the RASS Committee.

In addition to the potential ratings, the study developed a more specific evaluation method for determining the actual impact which airports have upon adjacent communities. This method focuses on a particular emission source and and quantitatively measures the concentrations of its emissions at various receptor sites. The concentration levels attributable to aviation are then considered together with already existing pollution levels at the receptor sites. When compared to air quality standards, then it is possible to determine how much further emissions activity a given site can tolerate. Again, this process can be applied to any airports and receptor sites the Committee may wish to consider.

ASSUMPTIONS

Following are the assumptions underlying the air pollution calculations and analyses. These may be open to question and should be reviewed and evaluated by the Committee:

+1. Figures for present and future aircraft operations and ground vehicle activity were taken from the forecast, capacity, and access work done in Phase I of the Study.

2. A. In order to provide some insight into 1975 and 1980 demand conditions, those interim figures were derived simply by extrapolating from the 1970 and 1985 figures given in the Phase I forecast.

   B. While figures are given in the report for total number of airport operations at present maximum capacity and future maximum capacity, these conditions will notin fact occur simultaneously for all airports.

   C. The allocation of total demand among airports is only one of many allocations which could be made. The Committee may have to re-estimate the air emissions levels at specific airports based upon <u>their</u> allocation of total demand. This can be done for any of the alternatives which the Committee may wish to consider.

3. Future aircraft mix conditions were obtained from Technical Memorandum II-I and the forecast report of Phase I of the Study.

4. All JT8D engines will be retrofitted with new "burner cans" (no visible smoke trail) by the mid-1970's. No other enginer retrofit for air quality purposes is assumed.

5. There will be no residual fuel dumping after 1975.

+ Refer to Chapter 1 discussion of air quality for revised figures.

6. New motor vehicles will meet federal and state emission requirements for each model year from 1971-76; no more stringent controls will be mandated for models after 1976; retirement/replacement ratio of automobiles will remain constant.

7. The Hybrid Diffusion Model can reasonably predict air emission concentrations at locations adjacent to the source.

8. The regulations of the Bay Area Air Pollution Control District will be fully effectuated within the nine-county Bay Region. (Note that certain outlying areas have since been excluded as unique air basin areas.*)

9. Area-wide growth will continue.

10. No specific guidance concerning air quality is available in the Regional Plan.

ISSUES

From this background and these assumptions, the issues relevant to aviation pollution can be identified:

1. Should the Committee include in its considerations the need to anticipate future state and federal air quality standards, particularly with respect to visible smoke from existing jet aircraft?

2. In developing aircraft emission data from various sources, it was necessary to make certain judgments about selection and calculation. In some cases, there were substantial differences of opinion among technical sources.

3. While the placement or expansion of an airport in a certain location may be satisfactory based upon the general area's pollution potential rating, emissions at particular sites close to the airport could still exceed standards. Thus, both the general and the specific pollution situation of various locations must be considered.

4. Highway travel to the airport is a significant source of aviation-related pollution. This was not included in the present work.

5. The amount of pollutants generated by an aircraft trip, even when the ground access at both ends of the air trip is included, is much lower than the amount which would be generated if the same number of passengers went that distance by automobile. Estimates of how much lower this amount is vary, but it is, in any case, substantial. (See Chart 2)

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* The northwest portion of Sonoma County and the northeast portion of Solano County have been excluded as of Spring, 1971.

6. This home-to-airport ground access comprises a sizeable proportion of the total pollution from an aviation trip. If access were made more efficient, air travel would be, emission-wise, even more "economical" than equivalent automobile travel:

   A. Reducing airport access distance is one way of reducing access and overall area pollution. On the other hand, airports placed close to urban centers may cause air quality standards at nearby sites to be exceeded. Thus, overall access pollution must be weighed against specific site pollution. User convenience must also be a factor when considering access distances.

   B. Alternative or improved vehicle modes are another means of reducing ground access pollution. Rapid transit especially could enable the placement of an airport site at a distance from urban centers without causing large amounts of air pollution, if a large proportion of the people going to and from the airport use it.

7. A good location for air quality may be a poor location for many other factors.

8. In the airport alternatives which the Committee is investigating, the extremes in automobile access average trip distance are represented by a minimum of 21.4 miles and a maximum of 46.0 miles. The <u>difference</u> between them is estimated to contribute 77 tons of contaminants per day by 1985 from automobile trips by passengers, "greeters and God-speeders," employees, and other automobile business purposes to airports.

9. Is it meaningful for the RASS Committee to decide that no major airline jet operations shall be placed in an area with a pollution potential rating of V if similar pollution control measures are not undertaken by other regional planning agencies?

10. Can the proportion of air contaminant contribution by aviation <u>to the Region</u> be used in judging the proportion acceptable in a <u>local</u> basin?

11. In the selection of airport alternatives, should the Committee attempt to minimize air emissions from all sources, including motor access?

AIR POLLUTION POTENTIAL OF AREAS AROUND MAJOR AIRPORT SITES

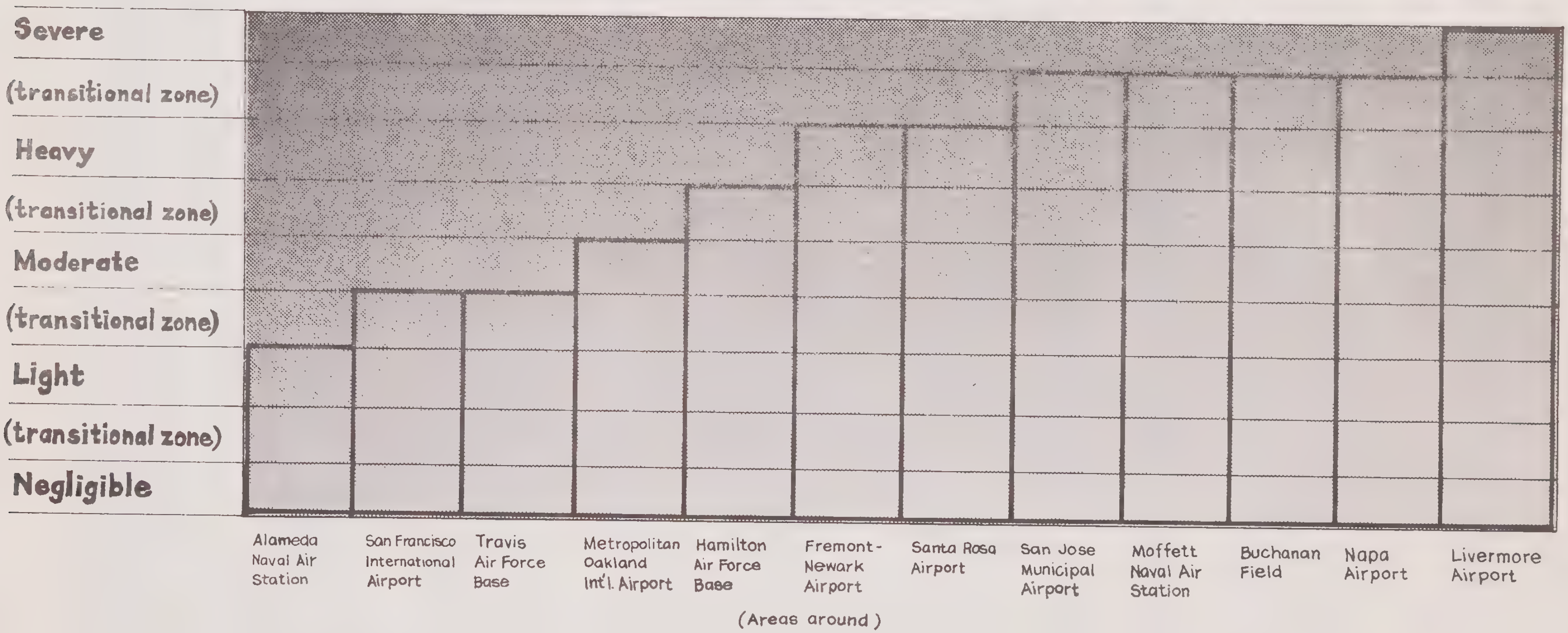

Chart 1

CHART 2

AIRCRAFT VS. GROUND VEHICLE EMISSION LEVELS

Source 1: Knut Hammarskjold, Director General, International Air Transport Association

Current Jets	3# pollution/1000 seat miles *
Future Jets	2# pollution/1000 seat miles
Current Automobiles	52# pollution/1000 seat miles
Diesel Trains	9# pollution/1000 seat miles

Source 2: Department of Transportation study for the National Aeronautics and Space Engineering Board of the National Academy of Engineering, Washington, D.C.

1975 Jets	7# pollution/1000 seat miles
1975 Automobiles	84# pollution/1000 seat miles

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* a seat mile is one available passenger seat in a vehicle traveling one mile

AVIATION NOISE EVALUATIONS AND PROJECTIONS FOR THE BAY REGION*

ASSUMPTIONS/ISSUES PAPER

INTRODUCTION

Noise is currently the most critical environmental problem associated with aviation in this country. Public reaction to this "invisible pollutant" has been continual and voluble over a number of years, ranging from individual complaints to community lawsuits. Present dissatisfaction and concern for the future are so great that decisions about the expansion of existing airports or the development of new airports have, at times, rested almost entirely upon questions of noise. The public demand for both a continuing growth of air transportation and a liveable noise environment indicates the urgent necessity for careful noise evaluation and planning, from the aircraft source to the land uses on the ground.

There are ways to control aviation noise and to coordinate community and aviation growth. A vital task confronting the RASS Committee is the determination of what the best ways are and how to achieve them. In so doing, the Committee must consider a wide range of factors and issues, determine the relationships between them, and somehow resolve and unify them all into workable solutions. The purpose of this paper is to help identify these factors and issues relevant to the problem of noise and to indicate some of the decisions which will have to be made.

REPORT SUMMARY

Considerable study has been devoted to the measurement of aircraft noise and the interpretation of its effects upon people, both as individuals and as groups living in communities. Two general types of noise descriptors have evolved:

> Those concerned with the measurement of <u>single events</u>, such as takeoffs, landings, and overflights
>
> Those concerned with the measurement of the <u>noise environment</u> resulting from numerous individual noise events

Since aviation noise problems begin with aircraft and their use of airports, the evaluation of the COMPOSITE NOISE ENVIRONMENT is of primary concern. The particular measurement procedure chosen for this study is the <u>Noise Exposure Forecast (NEF)</u>. Aircraft noise loudness, quality, duration, frequency, and time of occurrence (day or night) are all included in NEF measurements.

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* Prepared for the Regional Airport Systems Study Committee November 5, 1971

Based upon such factors as noise complaint histories, speech interference criteria, subjective judgments of "noisiness," and the need for freedom from noise interference, the compatibility of different noise levels with various land uses can be evaluated. These evaluations of noise impact provide a guide for land-use and "people" planning around airports. The 30 NEF value generally defines the boundaries of areas where aviation noise is of some concern. (See Chart 1 for additional description.)

Noise Contours

The general noise environment in an airport vicinity can be visually described by the drawing of noise contours which are based upon NEF projections. While 1970 contours reflect a present level of traffic and noise activity, any contours drawn for a projected date must necessarily use certain assumptions about future aircraft types, runway utilization, flight procedures, and airport use. Different combinations of assumptions will produce a variety of alternative descriptions.

The 1985 airport contours used in the report represent a level of activity based upon the maximum capacity of existing runways at the given airport, with a defined aircraft mix and current (1970) methods of operations. Not all airports, or airport combinations, as defined by the RASSC in the eleven alternative airport systems, were considered. This is because the complexity of the process and the large number of alternatives which would have to be included made a complete analysis impracticable. However, the definitions and analytical techniques which were developed provide a broad understanding of approach and method, and also make it possible to focus on any specific alternatives which the Committee may wish to examine more closely at a later time.

To give an idea of the actual impact which specific airports do have, the University of California is calculating for the RASSC the land-use of areas within the 30, 35, 40, and 45 NEF contours at SFO, OAK, and SJC, using contours for both current (1970) usage and projected (1985) capacity. The amount and type of land and buildings which are affected by certain noise levels are being identified and can then be compared for land-use compatibility (See Chart 1). Again, this procedure can be applied to the environment at any other airport.

Single Event Noise

Single event noise problems have not in the past been as widespread as problems in airport neighborhoods. Complaints about noise from high altitude overflights over scattered residential areas are growing, however, and are likely to demand much attention as they increase in the future.

People's perception of such overflight noise is extemely variable. Its "noticeability" greatly depends upon the already existing noise situation of the area intruded upon. Differences in reaction to the same noise level will thus arise among various communities, as well as in the same community under varying conditions.

Reactions among individuals also seem to be markedly influenced by personal attitudes and feelings about the source and purpose of the noise. People make judgments of a noise's "appropriateness" based upon such conditions as its necessity, legality, and avoidability. Negative feelings toward overflights may thus be much stronger than would seem warranted because the noise is thought to be less acceptable than equivalent automobile loudness or directly airport-related events.

ASSUMPTIONS

Following are the assumptions underlying the noise evaluations and projections. These may be open to question and should be carefully reviewed by the Committee.

+ 1. The NEF method of analysis represents a valid means of description and projection.

+ 2. Projected 1985 contours, because of their reliance on assumptions about future aircraft types, airport use, etc., are predictive rather than precise.

3. The land-use compatibility charts define the effect of noise upon different environments. This is but one interpretation. And within this interpretation, the definitions are not meant to be exact. The 30, 35, 40, etc. NEF values must be viewed as having a certain degree of flexibility in relationship to the land uses to which they are applied.

+ 4. The work done in noise characteristics of aircraft engines has assumed that:

   - <u>all</u> new aircraft engines must meet Part 36.* The effect of increasing the weight of already certificated aircraft was not included.

   - all pre-Part 36 aircraft will be retrofitted by the 1980's or not used in the Bay Area.

   - retrofitted engines on old airplanes will demonstrate the ability to meet Part 36, <u>but</u> since they are not required to be operated in the mode used in certification, somewhat higher noise levels will be experienced.

   - the existing fleet of business jets will not be retrofitted.

5. It was assumed that if there is an SST operating into the Bay Area airports:

   - arrivals and departures will be subsonic.

   - the aircraft will meet Part 36 noise certification.

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* Federal Aviation Regulations, Part 36, "Noise Standards: Aircraft Type Certification."

+ See Chapter I discussion of noise for any revisions.

ISSUES

In choosing the best solution to noise control and planning from the options available, many considerations other than noise itself must enter into the decision. It is apparent that a benefit for one aspect of aviation planning may be a liability, or even impossibility, for another. All must somehow be weighed and connected.

1. A. Within the last few years, governmental steps have been taken to control aviation noise. These include the introduction of federal noise certification requirements for jet aircraft* and the setting of noise standards by the California State Legislature for operations at state licensed airports.** The RASSC must include in its considerations the need to comply with such standards.

   B. Should the Committee use the State of California's proposed noise regulations for the year 1985 as a standard for their 1985 planning? Criteria for defining Impact Areas for non-compatible land-uses would then be as follows:

residential and educational	30 NEF (approximately 65 CNEL) and above
commercial	35 NEF (approximately 70 CNEL) and above
industrial	40 NEF (approximately 75 CNEL) and above
agricultural and open	40 NEF (approximately 75 CNEL) and above

2. Airport operating procedures must at all times consider safety as paramount. Options such as runway utilization or engine thrust settings may be qualified by safety.

3. The ability to provide noise abatement and at the same time preserve or increase airspace capacity may be constrained by technological feasibility. In aviation planning, should noise considerations take precedence over capacity and economic considerations?

4. Compatible land-use is often already negated by present uses at existing airports. Changing this would be extremely difficult and costly. Planning for "buffer zones" at new airport sites will also be costly, perhaps prohibitively so. At the same time, noise complaints and citizen actions demand appropriate response.

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* Federal Aviation Regulations, Part 36, "Noise Standards: Aircraft Type Certification."

** California Department of Aeronautics "Noise Standards," California Administrative Code, Chapter 9, Title 4 (Register 70, No. 48, dated November 28, 1970).

5. The placement of a new airport site where there is adequate noise buffering may mean long access distances. Cost and user convenience are at issue here.

6. What is a good airport location for noise may be a poor location for air quality or land-use.

7. Is the Bay itself an acceptable noise buffer area?

8. Can "noisy" neighborhoods and areas be allocated more aviation overflight than "quiet" ones?

9. Should the standards used to govern civilian airport planning be required of the military?

10. Should the RASSC assure that traffic control routings can provide specific limitations to exposure from aviation noise?

11. The NEF numbering system 30, 35, 40, etc. is linear; the noise characteristic measurement used to develop it is logarithmetic; and the land area is a square function. The end result is that a reduction of 3 NEF:

    - requires a 50% reduction in aircraft operations

    - makes a very large percentage change in land area within a contour

    - <u>and yet may result in a noise reduction not perceived by the public</u>

SIMPLIFIED LAND USE INTERPRETATIONS OF NOISE EXPOSURE FORECAST VALUES

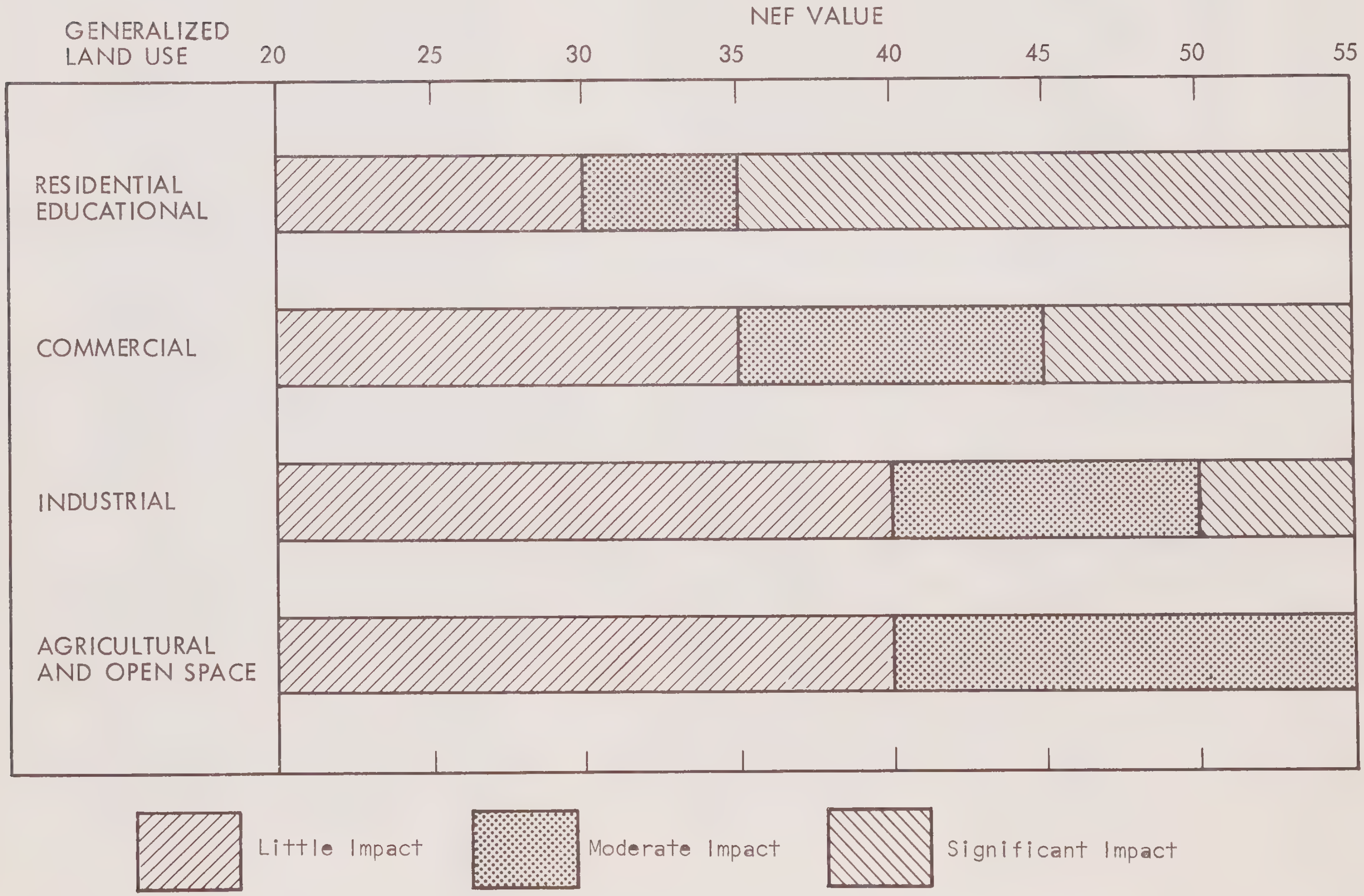

Chart 1

Chart 2

COMPARISON OF APPROXIMATE LAND AREAS
WITHIN NEF 30 AND NEF 40 CONTOURS*

AIRPORT		YEAR	YEARLY VOLUME AIR CARRIER OPERATIONS	APPROXIMATE LAND AREA WITHIN NEF CONTOURS,* SQUARE MILES 30 NEF	40 NEF
San Francisco	(1)	1970	333,435	19.4	1.8
	(1)	1985	382,000	11.3	0.6
	(2)	1970	333,435	16.3	1.2
	(2)	1985	382,000	8.8	0.4
Oakland		1970	58,805	3.8	0.1
		1985	221,000	4.6	0.3
San Jose		1970	52,171	3.6	0.3
		1985	117,000	5.8	0.5

* Exclusive of land within 1970 airport boundaries.

(1) 1970 Runway Utilization

(2) Projected runway utilization for allowable takeoff crosswind component of 20 knots.

NOTE: Adjustments in the numbers of operations assumed for 1985 would result in corresponding adjustments of the land areas within the various NEF levels.

THE EFFECT OF AVIATION ON PHYSICAL ENVIRONMENT AND LAND USES*

ASSUMPTIONS/ISSUES PAPER

INTRODUCTION

This is one of a series of issue papers on estimated requirements or effects of aviation growth on the Bay Region for the Regional Airport Systems Study Committee. The two purposes of these papers are: to aid the Committee's digestion of detailed consultant reports on each study element and to air some of the issues posed by them.

This paper covers The Effect of Aviation on Physical Environment and Land Uses by Wilsey and Ham, one of three consultant reports done under the environmental quality element of the study. In the absence of a proven evaluation process, Wilsey and Ham tried to set up a systematic method for evaluating environmental sensitivity to aviation activity in the Bay Region. The report combines the findings of the other two reports, Aviation Noise Evaluations and Projections and Aviation Effect on Air Quality, along with other aviation effects in an attempt to develop a systematic process of evaluation for "early warning."

REPORT SUMMARY

Scope

The environmental quality report presents only an environmental overview of the Region, neither an in-depth analysis of specific aviation alternatives chosen afterwards nor an evaluation of specific projects. Specifically omitted are geological factors for specific projects, e.g., earthquake hazard, subsidence, flooding and unstable substrata, and fill material. These factors are presently under study by the U.S. Geological Survey, which will publish its findings.

An Emphasis on Environmental Sensitivity

The report centers on the development of an "early warning" process to systematically scan the key effects of aviation activity upon people, animals, plants, and natural features of the Bay Area. It also includes:

a) an inventory of life and natural features deemed sensitive to aviation development effects of noise, emissions, water pollution, and other influences on land use
b) a land use pattern map for the present (1970)
c) a general picture of land uses for the future (1985-90)

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* Prepared for the Regional Airport Systems Study Committee November 5, 1971

The key concept of the "early warning" process is the environmental sensitivity level (ESL). ESL is an estimate combining a habitation area's expected sensitivity to noise, air, water, and land use impact assumed for three levels of aviation activity. The ESL fits on a Regional map where it flags sensitive habitats before an aviation alternative is recommended.

Habitats

The Bay Area environment was studied, mapped, and classified into human and wildlife habitats. Human habitats appear as three use groups: 1) agricultural 2) residential and educational institutions and 3) commercial, industrial, and military. Wildlife habitats appear as five physical-biotic types: 1) shallow water 2) mud flats 3) salt ponds 4) salt marshes and 5) grasslands.

Excluded from consideration are deep water and land above 15% slope, assuming an unsuitability for aviation development.

In the work, the contractor consulted federal, regional, county, state, and municipal land use reports and plans and the organizations that created them in many cases.

The ABC of ESL

The ESL composite index is approximate not precise, as its general derivation suggests and a closer look confirms.

The ESL originates as follows:

A. Each habitat is rated for its sensitivity to each aviation impact - once for "objective" effect and once for "subjective" concern. (5, high; 3, medium; 1, low)

B. The two ratings for each impact are then multiplied together.

C. All these impacts are totalled for each of the eight habitats. The habitats with the larger totals are the most sensitive.

The habitat totals themselves are grouped into high, medium, and low sensitivity. These are then drawn as an Environmental Sensitivity Level Contour Map, the use of which is urged by the consultant.

Contained in the "early warning" system is a matching of three levels of noise, air, and water pollution impacts to an inventory of five wildlife and three human habitats.

The ESL formula with "fudge" factor is" $ESL = A(B) + \emptyset$

where: A = "Objective" Environmental Resource Rating
B = "Subjective" Environmental Resource Rating
Ø = Unknown or other change factor

The main input to the ESL "early warning" is the consultant's dual estimate of A) "objective" effect and B) "subjective" concern.

A) "OBJECTIVE" estimates generalized standards of the Bay Area Air Pollution Control District Combined Pollutant Index, the San Francisco Bay Area Regional Water Quality Control Board, and the FAA's Noise Evaluation Forecast (NEF) for air, water, and noise impacts, respectively. Other impacts estimated were more judgmental.

B) "SUBJECTIVE" ratings, lacking a regional opinion survey, were presumed for the public by the consultant, based partly on the Environmental Attitude Study: Summary of Findings, San Jose, Santa Clara County Transportation Study. It was assumed that the closer the public could see impacts on other species as indicators of potential effects on human life, the higher the "subjective" concern assigned to such species of their habitats.

Other Impacts

Valued items outside a neat noise, water, and air scheme were fit and rated under two categories: "Disruption of Wildlife Habitats" and "Other Environmental Concerns."

Under the analysis, Distinction and Difference, habitat sensitivities tended to be at least medium for all human and wildlife categories. Over the range of items rated, the objective vs. the subjective results differed little.

More Materials

Besides or leading to the ESL "early warning" process, the report has other maps, an inventory of wildlife, background information and observation, and a Wildlife Habitat Ranking System.

The Regional Wildlife Habitat Ranking Map supplements the ESL maps by ranking areas of high, medium, and low importance according to ecological criteria - diversity of species, presence of unique plants or animals, productivity, proposed or present wildlife refuge, etc.

The 1990 land use picture stretches maps, assumptions, and estimates into a picture. Looking ahead, the report observes that "the need for additional airport facilities is largely based on population growth and that it is ecologically vital to realize that no population can continue to increase indefinitely in a given area." The population issue which underlies the others cannot be resolved by the RASS Committee alone. It will need close consideration in view of recent shifts in population patterns and public opinion.

FEATURES OF THE METHOD AND ASSUMPTIONS

Regardless of the source of increased aviation demand - more people flying, or people flying more often, or both - from an environmental standpoint, the effect of more or expanded facilities remains to be evaluated. The nature of the problem and the features of the "early warning" method and the assumptions need to be related.

Adjustability

The ESL process operates in an area with many unknowns, uncertainties, and variables. This requires the approach be adjustable. Modification can come three ways: a) using the formula's fudge factor b) changing the itemized list of impacts or resources c) re-weighting the elements.

On "Bay Fill," for example, "subjective" concern has been strong enough to create and support BCDC. Accordingly, if it were felt that the "5" rating assigned slighted the importance of Bay Fill, then an additional category could be added to the list or the fudge factor could be activated for Bay Fill. The work's exclusion of deep water may have deleted a key concern and reduced the value of the process in this dimension.

Ambiguity and Reliability

- One ESL number may mean two different things to two different people. Two people may agree on a number but not its content because the same number may be the product of several combinations of multiplied ratings.

  ESL = (objective) X (subjective) + change factor (if any)

  The factors need to be backed out of the results to see where agreements lie.

- As a single composite index, ESL sacrifices accuracy and meaning for simplicity. Simplicity itself is good for an "early warning," but a second or third look will always be needed. <u>ESL generalization requires qualification and its use must be limited to its reliability range, which is low</u>.

Nature of the Problem and a Dubious Distinction

- There is rarely a clean-cut technical answer to a problem whose solution inevitably involves political decisions on what is "acceptable." In defining acceptable levels of environmental impact, acceptable levels of aviation growth are also at issue, to the extent that they conflict. The Committee is charged with considering the technical information, including the effect of aviation on the physical environment, before making its decision on the "best" alternative in the political arena.

The "objective" - "subjective" distinction at the bottom of the ESL process is dubious for several reasons. First, it dilutes the technical findings of effect with preempted political policy findings. Second, it did not serve

the analysis, in view of the complexity of the environment, the current state of ecological analysis and the heavy dose of judgmental input which both ratings share. In any event, the "objective" and "subjective" ratings were substantially similar and the distinction did not make much difference in the results.

- The "objective" rating is expert opinion partly substantiated. The "subjective" rating is expert presumption of public opinion. In each case the consultant did the rating. (A public value survey was suggested in the report.)

- The "early warning" process is to spot environmental risk, not to presume public opinion and the expression, perception, and preference going into it. After the public and the decision-makers are informed, "subjective" preferences can be heard and considered - environmental as well as others.

BROAD AND POINTED ISSUES

- In light of the Environmental Report and the needs of the Committee, the smaller issues seem to stem from two big ones:
  1) Is the Environmental Report usable? If so, how, where, and to what extent?
  2) What else is available? Should it be used instead of or besides the consultant's work?

Usability

On the first issue, the report contains some pieces useful in themselves as the inventory, wildlife habitat ranking and criteria and associated maps, but it centers on the ESL process. Questions on the ESL process include the following:

- Has it formulated the "problem" enough to yield a useful result from available inputs?
- Does it include key risks or concerns in its categories?
- Can you rely on it? Where? Where not? To what degree?
- Is it clear?
- Is it easy to use, to explain, and to justify to your constituents?
- Is it capable of being modified or supplemented?

What Else?

- On the second issue, it is important to recall that the report was done in the first place because there was no one proven, systematic, overall evaluation process known to us.

- For two aspects of impact - noise and air pollution - the separate reports are available.

- On Bay Fill, BCDC's San Francisco Bay Plan, page 1, reads:

  "... Some Bay filling may be justified for purposes providing substantial public benefits if these same benefits could not be achieved equally well without filling. Substantial public benefits are provided by: ...(c) developing expanded airport terminals and runways if regional studies demonstrate that there are no feasible sites for major airport development away from the Bay..."

- At issue is a definition of "feasible" and a demonstration that non-Bay sites either fall into or out of the definition. "Feasible" involves any criteria that could kill a non-Bay proposal: noise, cost, access, number, and identity of people benefiting, etc.

- The Bay Plan of BCDC suggested a regional airport study but leaves the Committee with the problem rather than a systematic process for resolving it. Unlike the airport study which is charged with making a recommendation of alternatives at a given time, BCDC is on-going and acts on a project by project basis as each is submitted.

- For Bay Fill, use of the U.S. Army Corps of Engineers' Bay Simulation Model is costly, time-consuming, and inconclusive on the effect of fill at airport expansion scale. Supplemental mathematical models would also need to be used. After deliberation, the Committee chose to hold off on the Model until specific Bay alternatives become imminent. In that case, this dimension would revive as a design feature.

- Certain U.S. Geodesic Survey findings will become available but would probably not become decisive on the regional scale.

- A growing body of environmental law will need to be considered as the Committee narrows the alternatives. Recommendations made would need to result in effects which would be within legal limits.

- The Environmental Report is testimony to the difficulty of trying to devise a usable systematic process for evaluating the impact of aviation on complex Bay Area environments where changes act in acute and chronic ways which will take years to unravel.

Pointed Issues

In searching now for the "best" balance, the Committee will need to make some presumptions in the absence of precisely proven effects in some areas. In view of the Committee's imminent needs and the limitations of the Environmental Report, it would seem that the report could be used but only on a qualified basis. As a presumption for avoiding airport facility development in a sensitive area, an ESL level of 5 (high - medium or above) could be useful.

In pointing environmental concerns toward aviation alternatives, the following issues seem to stand out.

1. Should the Committee presume that unless proven otherwise, areas of high - medium or above environmental sensitivity (ESL) are unsuitable for new aviation development? If so, shall the Committee then return to the specific content of ESL for the area in question to make a more conclusive recommendation? If not, should the Committee bypass the ESL and proceed directly with its components?

2. Where existing aviation facilities are in high - medium or above sensitivity areas and that rating has been established, should further expansion be disallowed?

3. Where indirect effects of proposed airport facility expansion would adversely affect high - medium or above sensitivity areas, should such expansion be disallowed?

4. Where building facilities would adversely affect existing or proposed wildlife sanctuaries rated high under the Wildlife Habitat Rating system, should such building be disallowed? (The rating system has criteria such as unique species, number and diversity of species, productivity, etc.)

5. Presuming any Bay Fill is bad, should it be allowed if it results in substantial public benefits elsewhere, i.e. a reduction of actual or potential residential noise exposure, avoidance of prohibitive capital cost, avoidance of prohibitive access costs to a substantial number of passengers? What are the limits of "feasible?"

6. How can a recommendation assure that the technological and fiscal capacity exists to keep water quality up to state standards in the area affected?

To complete the environmental issue package, the issues posed by this report will need to be considered together with the issues posed by the separate noise and air pollution reports.

BAY FILL *

ASSUMPTIONS/ISSUES PAPER

The Bay as a Unique Concern

As you know, San Francisco Bay occupies a very special place in the Region and its institutions as well as in State legislation. The unique and irreplaceable but vulnerable values it offers present and future generations of the Region deeply concern citizens, organizations and governments here.

For example, "Protection and enhancement of the San Francisco Bay and the region's environmental qualities and major physical features" is stated goal number one of ABAG's Regional Plan to which the Regional Airport Systems Study Committee results will be added. But the final word on fill is the San Francisco Bay Conservation and Development Commission's. BCDC, one instigator of a regional airport study, has been a watchful and active ex-officio member of the study and will be very interested in its results.

Airport Fill as an Issue in the BCDC Bay Plan

Airports occupy a conditionally favored place in BCDC's Bay Plan. The BCDC Plan finds that the shoreline of the Bay is a favored location for airports due to open space for take offs and landings away from populated areas and its convenience to present population centers. In enacting the law under which BCDC proceeds, the legislature found and declared that airports are one of the few purposes for which fill may be necessary under certain conditions to to be determined. BCDC's enforcible San Francisco Bay Plan, (p. 1) reads:

> " ... Some Bay filling may be justified for purposes providing substantial public benefits if these same benefits could not be achieved equally well without filling. Substantial public benefits are provided by: ... (c) developing expanded airport terminals and runways if regional studies demonstrate that there are no feasible sites for major airport development away from the Bay..."

At issue is a definition of "feasible and a demonstration that non-Bay sites either fall into or out of the definition. "Feasible" involves any criteria that might kill an upland proposal in your judgment: noise, cost, access, number, identity of beneficiaries, and governmental arrangements, etc.

BCDC's Plan called for a regional airport system plan study which would address these issues in the context of other factors.

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* Prepared for the Regional Airport Systems Study Committee, June 1, 1972.

Early Consideration of Bay Fill by RASSC and the Staffs of BCDC and the U.S. Army Corps of Engineers

During its September, October and November, 1970 meetings, the Committee explored how and when to best fit fill into its work and what tools might be available to demonstrate the effects of various fills.

The Committee debated two approaches and in effect eliminated #1.

1. Some members favored analyzing fill along with noise, air pollution, capital cost, etc. They tended to assume that it was possible and practical to measure relevant effects of various fills. This approach took fill as a determining analytical factor from the start rather than a residual matter to be brought in later.

2. Others, including the then Chief Planner of BCDC deemed it more practical to investigate Bay fill only if Committee evaluation of the other factors favored further facilities in the Bay. While the aggregate effect of all fills was clearly detrimental, no studies were likely to demonstrate all the specific effects of each individual project, claimed BCDC's Chief Planner.

Staff from the U.S. Army Corps of Engineers told the Committee that the Corps could make its Bay Model available given adequate advance notice but that the Corps would not act as a consultant to evaluate or interpret the results. BCDC's Chief Planner stressed two points: 1) For the variables it could measure the Model is not precise at the scale required for airports. 2) Only one or two experts in the Region could interpret the results and would need to know the details of project design for specific fills.

In view of the doubts and drawbacks an analysis of the effects of specific fills was not undertaken. * However, at its November, 1970 meeting, the Committee adopted in principle the following motion; "Any plan for airport expansion in the Bay will be subject to studies on its effects on the Bay using the Corps of Engineers Model and/or other analytical techniques."

On the verge of RASSC's recommendation, the Bay fill concern now emerges in the context of work completed in other areas, public reponse and further BCDC Staff suggestions.

Public Opinion

In addition to public concern expressed over Bay fill at the RASSC Public Hearings, in the press, and in RASSC's newspaper questionnaire, in early May over 600 letters, cards and telegrams came opposing Bay fill for airport expansion. Most of these likely came in response to an alert from Save San Francisco Bay Association. Much of this correspondence favored Travis AFB as an alternative to bay fill.

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* However approximate acres of fill for RASSC preliminary alternatives appear in BCDC December 29, 1971 memo - "Bay fill aspects of ABAG's Regional Airport Systems Study."

Present BCDC Staff Advice

The following timely points are offered by BCDC Staff for your consideration.

1. There should be a regional growth policy and passenger projections, among other things, should be linked to it. This would tie in with a program ABAG has already indicated it would undertake.

2. If the California Corridor traffic is a significant portion of the forecast demand, that traffic ought to go to upland sites. While Bay fill is permanent an argument for it may be only temporary for California Corridor traffic. One eventual alternative to fill for corridor traffic may prove to be a fast efficiency ground transit system between here and Los Angeles.

3. Noise impact only should not justify Bay fill. Again, fill is permanent but technological improvements in noise abatement technology may make aircraft noise temporary.

4. In any event, the time has not yet come to fill the Bay for 1985 projections which may or may not materialize. There is time left and no need to rush into irreversible action.

5. These are significant points BCDC Staff sees now but a thorough review of the RASSC recommendations may reveal additional factors which may bear on the decision.

To Fill Or Not To Fill/Issues And Assumptions

1. Opinion splits on what the issues are according to one's assumptions and priorities. The foregoing BCDC staff suggestions raise or answer some issues for you, depending on your own assumptions and priorities. Can you now assume the future through 1985 clearly enough to recommend permanent fill for what may prove to be a temporary need or for projections which may not materialize? How imminent is the need to fill the Bay if it were now assumed? Is it likely that conflict between Bay preservation and other regional concerns can be avoided in the long range? in the short range?

2. For some of the public, fill would be absolutely out of the question. The issue then is how to find and choose non-fill alternatives. If technical and political ingenuity couldn't find a "feasible" way then aviation growth would be constrained to that extent. For those who would be willing to trade off fill among other concerns, the issues and assumptions possible multiply and compound.

3. For some, including BCDC, fill would be justified only as a last resort-if and only if its proponents could convincingly <u>demonstrate</u> that there is no <u>"feasible"</u> way to avoid it. If fill is recommended the selection among alternative fills becomes an issue. Which does the least damage?

4. How should "feasible" be defined? Since the definition decides the outcome, opinion may differ on what is built or assumed into it. "Feasible" here means "acceptable" to a large extent - in the narrow sense acceptable to those who could veto or collectively enable a proposal - in the wide sense acceptable to the public at large. Any aspect which could kill or enable an upland alternative bears on its "feasibility".

What are significant demonstrations or estimates of "feasibility" or "non-feasibility".

- airspace feasibility?
- noise feasibility?
- access feasibility?
- capital cost feasibility?
- financial feasibility?
- market feasibility?
- routing feasibility?
- regional agency feasibility - creation of governmental and organizational arrangements for new regional airport (s)?
- etc.?

Within many of the possible aspects of "feasibility" are included other issues and assumptions, many of which have been probed in earlier issue papers.

5. "Feasibility", has now been brought to the political focus for committee recommendations and some political judgments will be necessary.

   Two examples:

   ACCESS vs. FILL - For the sake of the Bay with its wide benefits, what is the willingness of the average traveler to sacrifice some convenience for the few times a year he or she flies? How important is the problem of connecting flights (15% of the total)?

   TRAVIS vs. SACRAMENTO - How important is cutting into Sacramento's projected demand with Travis if Bay Fill is at stake?

While the technical work is important, priorities and willingness are an important ingredient of "feasibility" or "acceptability."

ECONOMIC STUDIES

Two economic studies were completed, one measuring the costs of airport development and the other predicting the economic effects of locating airports in various parts of the Region.

Capital Cost

Cost estimates are perhaps the least arguable of the planning factors. While they may vary with time, the relative costs of different alternatives are not likely to change much. The work done showed the value residing in existing facilities, and the extremely high cost of rapid transit construction, a factor to be considered particularly in the case of remote airport sites.

Economic Impact

The economic and spatial effects of alternative airport locations were evaluated through the use of an existing complex predictive model (the Projective Land Use Model - PLUM). Development, income, and revenue impacts were estimated. The study showed that the effects of various site locations would spread over very large areas, and suggested that location made little difference from a Region-wide economic standpoint, although sub-Regional effects would vary. The benefits of location would also have to be weighed against the costs shown in the other economic study.

CAPITAL COST OF AIRPORT ALTERNATIVES *

ASSUMPTIONS/ISSUES PAPER

INTRODUCTION

To meet growing aviation demand and make the best use of available economic resources, the relative value of any proposed airport alternative must be measured against that of other possible alternatives. The capital cost report reviewed the preliminary alternatives being considered by the Regional Airport Systems Study Committee (RASSC) and estimated their costs on a common basis to enable comparison. It is now possible for the Committe to weigh these costs against income and other anticipated benefits in order to determine the most feasible airport system based upon economic factors. Environmental and public service factors will then be examined along with these findings in order to define the "best" overall alternative.

REPORT SUMMARY

Cost estimates based upon costs as of May 1, 1971 were made for 37 alternative airport projects at 20 airports in the Bay Region. The levels of development considered for scheduled aviation airports were taken from the preliminary RASSC alternatives. Generally, the expansion of general aviation airports was estimated by using their existing master plans. Addition of rapid transit to certain projects brought the cost considerations to a total of 52.

Estimates reflect order of magnitude accuracy only. Their purpose is comparative analysis for planning purposes, rather than the determination of specific project costs for budgetary purposes. It was assumed that airports would be constructed with public funds, and private funds would then be invested for additional facilities. Estimates are therefore for the initial public investment only, although the amount of private and public investment at existing airports to date is shown.

The basic factors which were considered in deriving the estimates were:

- Travel and transportation demand, including cargo (from Phase I *Aviation Forecast*)
- Capacity (from Phase I *Airport and Airspace Capacity Analysis*)
- Location
- Suitability of soils
- Design assumptions, including access roads
- Possibility of rapid transit service to the airport
- Time of acquistion and construction

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* Prepared for the Regional Airport Systems Study Committee, Nov. 26, 1971.

Cost data was then projected for a number of periods in the future. This was done by estimating inflation rates for the future periods and applying them to the 1971 data. The four bench mark years chosen for the analysis were 1971, 1975, 1980, and 1985; these included three time frames, 1971-75, 1975-80, and 1980-85. The three major components of a project - land, building construction, and heavy construction - escalate at different rates and were therefore considered individually.

Finally, to reduce the projected costs to a common basis, the present value method of analysis was employed: a discount rate was applied to all of the estimates for future time periods. Discounting for a present value analysis and inflation do affect each other and may be, in some measure, offsetting. They are, however, independently acting economic forces and were computed separately. Using both of these factors, a means of comparing projects at different time periods was achieved.

ASSUMPTIONS

Following are the assumptions used in the capital cost analyses, to be reviewed and evaluated by the Committee:

1. Cost data for future time periods were calculated by use of inflation factors. Both a high and a low inflation rate were estimated for heavy construction and building construction. It was assumed in the calculations that the current high trend of cost escalation will continue to 1975 at a slightly decreasing rate, and the period 1975-85 will fall into the mean between the high and low escalation trends.

2. A 5% discount rate was used throughout the present value analysis, with the assumption that all projects would be subject to the same interest rate.

3. A contingency allowance of 15% was included in cost evaluation.

4. Rapid transit costs were estimated at $20 million per mile, except for the three major airports. For each of these, an allowance of $50 million (total) was made. While the cost of rapid transit may exceed this figure at these three airports, the exact percentage of the total cost that would be borne by the individual airport is not presently known (see Issue #2), and the $50 million figure was offered by the airport managers as an interim figure.

5. Engineering and architectural services were not included in cost estimates since they can vary widely.

6. Given no discernible current pattern, it was arbitrarily assumed that airports having a 1971 estimated public investment of less than $5 million would have an additional private investment of approximately 10%. For airports of $5 to $25 million, it was assumed that 75% would be public and 25% private. Airports of $25 to $50 million were assumed to be 50%-50% (see Issue #3).

7. Certain design assumptions about required land, buildings, access roads, and facilities (towers, runways and taxiways, parking, cargo handling, etc.) had to be made for both general and scheduled aviation airports.

ISSUES

From this background and these assumptions, the issues relevant to capital cost can be identified:

1. From the determination of airport costs comes the question of financing. While details of financing are not within the responsibility of the RASSC, the Committee must be assured that for any alternative chosen, financing is possible. * Issues arising from this include:

   A. Since the selected airport system will be regional in scope, should its financing also be regional rather than falling on the supporting city or county?

   B. How can a regional decision be imposed upon a local body if it is decided that financing be allocated to local sources?

   C. Once the financing is allocated, what form should it take; how should it be procured?

2. A. Because rapid transit is an extremely high-cost proposition, particularly when long-line sections are necessary, such a system will not be economically viable unless heavy usage is assured. Such usage may only occur if the airport is surrounded by a supporting community which generates additional transit demand.

   B. If rapid transit or other access modes also serve areas surrounding the airport, what proportion of their cost can be allocated to the airport itself? Once this is determined, who pays the airport's portion - airport owners, airlines, city or county supporting the airport? - and through what means?

3. There is now and will probably be in the future great variation among airports in public and private investment. Reduction of the proportion assumed for the private sector (see Assumption #6) will necessitate greater public investment and thus additional funding sources.

4. There is nothing definitive about the timing of airport acquisition or construction beyond the fact that there will be certain levels of capacity needed by certain time periods. Because of rapid real estate cost escalation, however, early acquisition of land may be desirable. The analysis indicates the costs of delay in relation to this.

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* See also the Issue Paper "A Review of Airport Ownership" in the Special Study section of this chapter.

ECONOMIC AND SPATIAL IMPACT OF ALTERNATIVE AIRPORT LOCATIONS *

ASSUMPTIONS/ISSUES PAPER

INTRODUCTION

It is conventional wisdom to view airports as substantial contributors to the economic vitality and spatial development of the Region and its parts. How much they would contribute and where, under simulated airport patterns is the question this report addresses. Granted some pattern of airports will occur, the report asks: What differences do different airport patterns make to the Region and its parts? It is up to the Committee to decide what differences the differences make in a regional context. As it works toward a regional airport recommendation, the Committee's economic findings will then be viewed in the perspective of its other concerns such as capital cost, access and environmental quality.

REPORT SUMMARY

The economic report, unlike the environmental quality report begins with both specific alternatives and an existing modeling process, the Projective Land Use Model (PLUM), the heritage of BATSC, RTPC and ABAG, and MTC.

The economic report estimates selected development, income and revenue impacts of eleven simulated airport development combinations chosen by the Committee so far. These alternative assignments of passenger capacity to a specific combination of airport locations meet the 1985 demand forecast in all cases but one - the eleventh alternative which limits growth to existing capacity of the three major airports and misses projected demand by 35%. This "no growth" eleventh alternative has an additional and unique role. It is a useful baseline against which the other alternatives can be compared in terms of three groups of variables:

A. Development effects
   1. Basic employment
   2. Population serving employment
   3. Population-number and location
   4. Dwelling units-amount and location
   5. Land area used in urbanization

B. Income effects (limited to household income, other outlays and revenues being hard to trace)
   1. Median household income levels
   2. Aggregate personal income as an indicator of potential purchasing power
   3. Potential taxable sales

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* Prepared for the Regional Airport Systems Study Committee, November 26, 1971

C. Governmental revenue effects (county basis)
   1. Sales tax
   2. Income tax
   3. Residential property tax (excluding industrial, commercial, and agricultural)

Process Sketch

People who seek the results alone without their origin can skip this process sketch and go directly into the "System-wide Results" section.

In input process * a) identifies the model's zones of basic employment impact due to traffic volumes at each airport in each of the eleven given alternatives; b) finds relationships between traffic volumes at each airport and changes in basic employment by SIC industry categories. Basic employment categories were identified as wholesale, air transportation, hotels, and federal government; and c) calculated for each alternative land use absorption and basic employment numbers.

The focus of the methodology is on change from the base year (1965) to the target year (circa 1985). The baseline runs contain regional growth other than airports. Each of the eleven airport alternatives is tested against the baseline run without the aviation employment and the differences are noted in the variables examined. Changes in the key variable, basic employment, "ripple out" changes in housing, population-serving employment, and the income and tax estimates which flow from them according to the modeling process.

A basic employment gain from the base year to the target year is developed under region-wide forecasts of employment and population. That part of the employment gain including "basic" employment is allocated to specific zones in the region. This allocation "drives" the PLUM model from the base year to the target year. The alternatives runs include the simulated alternatives for airport growth.

Basic employment growth generates gains in dwelling units which are allocated to vacant land available for residential development. If development gains exceed available land in a zone, then the excess is reallocated to zones with available land.

These residences, in turn, attract population-serving employment and facilities including retail trade, service facilities, local government, construction, finance, etc.

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* Mitchell Research Associates, Appendix A, Economic and Spatial Impact of Alternative Airport Locations, July 1971.

An allocation rule distributes workers to residences and population-serving establishments to residences. It is controlled by a) the model's rules on time-distance from the origin and destination zones and b) by the availability of "opportunities" at the destinations measured by the residential holding capacity of the destination zones.

$$\text{holding capacity} = \left(\begin{array}{l}\text{land available for}\\ \text{residential development}\end{array}\right) \times \left(\begin{array}{l}\text{existing net residential}\\ \text{density in each specfic zone}\end{array}\right)$$

Holding capacity is limited to the maximum "feasible" quantity of infrastructure (water, sewer, etc.) which can be located in the period from the base to the target year. For allocating residents' purchasing power, opportunities are measured by base year population-serving employment.

Growth at places of employment and residence is added to the existing base year stocks of business and governments establishment and residence. These are the target year forecasts.

Zonal income levels and zonal mean dwelling estimates are produced by regression equations utilizing PLUM output.

Taxes depend on PLUM income and population projections. Alternative runs minus baseline runs give the taxes generated by the specific alternatives.

<u>System-wide Results</u>

The report's findings on the variables examined came in the form of computer maps and detailed charts at the regional, county, and local level. The focus of the RASSC concern is at the regional level and in this context the following points stood out.

1. Four basic industry categories are significantly influenced by airport activity levels in the Bay Region: a) air transportation, b) hotels, c) wholesale, and d) federal government. Growth ratios have been geared to airline passenger growth for these by zone.

2. Basic industry land requirement averaged between 10-20 employees/acre with some spread such as hotels at 90/acre.

3. For all basic employment in airport zones, the spread for the region is 50,000 employees among alternatives which range from 100,000 to 150,000 "basic" employees. The spread for the four directly airport linked basic industry categories (point #1 above) is about 21,000 basic employees.

4. At most among the alternatives there is a 2% difference in aggregate household income in the region for the target year. The alternatives range from 5.5 to 7.5% of total aggregate regional household income.

5. About half a billion dollars of annual household income is at stake. HOLRLV and PREFAC have 1.33 and 1.44 billion while TRAVIS and SFOKNO have 1.83 and 1.82 respectively. Some local differences are pronounced. Differences are minor in mean income levels among alternatives.

6. Land absorption is small relative to that available in the region. More critical than the amount of land absorbed is its location and value, which is not examined in this report.

7. Built up cities of the region have no population changes of any magnitude under any of the alternatives. Localized effects are greatest in HOLRLV and TRAVIS.

8. Residential property tax, the one most relevant to local government today, has some important variations. It seems that one would have to know the local expenditure side to compare it against in order to demonstrate what benefits accrue.

ASSUMPTIONS

The following assumptions underlie the economic report. They contain questions which the consultants had to answer in doing the work. As such, they may be reopened as the Committee reviews and evaluates them.

1. Each of the eleven alternative allocations on which basic employment size depend assumes a passenger loading per operation, a delay level and an aircraft mix in arriving at the number of passengers at each airport.

2. Basic employment directly associated with airport location includes only that basic employment which would shift location for variation in the region's traffic distribution. Such employment is assumed not to extend beyond the single airport zone except for SFO which has two zones.

3. Certain ratios for the future were assumed to hold between the number of passengers and the various growth rates of the four basic aviation industries identified - air transportation, hotels, wholesale trade, and federal government - at various sites. The report acknowledges the uncertainty involved in telling apart whether it was the airport or the good highway network around it that attracted basic industry such as wholesale trade.

4. Growth rates of basic industries other than the four above had to be estimated for the affected zones because it was an input requirement of the PLUM model.

5. A floating target year was used. It is assumed that this will not affect the value of the results so long as the focus is on a comparison of the alternatives as measured from a common baseline. The target year for RASSC is 1985, for PLUM 1980 and 1990.

6. PLUM's incremental methodology and data as updated are assumed valid enough for the purpose at hand.

   A. Population growth projection depends on State Department of Finance projections of April, 1967. Assumed is a long term level of net immigration of 300,000 per year to California.

   B. Employment estimates incorporate regional development trends that contributed to region-wide growth up to 1965 and which are assumed to continue in the future.

   C. Accessibility assumptions for the zonal network are: all locations are accessible to all others, and stimulated growth will not reduce the assumed degree of access

   D. Specifications of land unusable for policy or topographic reasons follows local planning practice.

   E. Zonal detail assumptions control the degree the region fills as growth is simulated.
      1. Basic employment occurs at <u>existing</u> (1965) net density.
      2. Residential density-growth in housing stock occurs at <u>existing</u> (1965) residential density.
      3. Population employment is simulated to locate without constraints up to the limit of available land.

   F. Priority of land use -where conflicting demand for land occurs, the order or priority is;
      1. Unusable land and open space, including the neutralization or stabilization of uses for policy purposes
      2. Industrial vacant land for basic industries and unique locators (airports)
      3. Industrial vacant land for population-serving establishments
      4. Other vacant land for basic and population-serving uses
      5. Other vacant land for residential development
      6. Acreage for streets and highways

7. Income levels and distribution - a 2% per year rate of increase in 1965 dollars was assumed.

   Substantial changes associated with policy shifts such as geographical dispersion of low income families or markedly higher quaranteed incomes would change the statistical structure on which the forecasts were estimated.

8. Tax variables produced at the end of the line of assumptions and methodology are meant to be used only as indicators of standards of living.

ISSUES

Since the report input, assumptions, process and findings could stimulate many questions, the following list is not exhaustive.

1. Did the report reveal useful differences and arrive at them in a reasonable way on the basis of reasonably accurate assumptions and input data?

2. Looking at the development and income variables, which are most significant when it comes to choosing among alternatives from a regional standpoint?

3. Margin of error vs. range, accuracy and significance of results - how do they compare? There is a 2% difference in total regional household income for 1985 at stake in the choice of alternatives. That is a close cut.

4. Is airport economic impact properly over or understated? Another view of economic impact assessment is the multiplier approach. It forecasts induced effects, usually two or more times the original investment. Dollars are recycled through the economy creating income and revenue as they go. The complications inherent in that approach are: What is really inducing what? Where does it end? The incremental approach used in this study is self-limiting. It tends to deflate the magnitudes potentially ascribable in the multiplier approach. Waves vs. ripples. What is an airport's influence?

5. No alternative is optimal for all objectives. For instance, the ABAG Regional Plan 1970-1990 aims at both a) strengthening metropolitan cores and b) starting new city centers at the fringes of the metropolitan area.

   Strenthening residential development in metropolitan cores is most served by OAKMAX, OAKGRO, ALGROE and PREFAC. Enhancing employment in large communities is most served by OAKMAX, SJEMAX, ALGROE, $SJEMX_2$.

   Starting a new town at the fringe in the region means TRAVIS.

6. From a regional viewpoint how decisive are economic benefits apt to be when compared to capital cost or environmental quality etc?

SPECIAL SUBJECTS

Many questions and issues arose during the study which were not directly covered by the consultants' work. These special subjects were analyzed by staff, drawing on some parts of the technical work and with the assistance of information provided by other professionals and agencies.

General Aviation

The general aviation paper brought together the material which is contained throughout the various consultants' reports and then expanded upon this information by identifying the assumptions and issues connected with it. With the new demand forecast, general aviation forecasts were revised from those shown in the first paper. These revisions, together with specific allocations, were presented in a second paper and formally adopted as part of the final plan. This detailed second paper is contained in Appendix A of this report.

V/STOL

The V/STOL issue paper resulted in the Committee conclusion that "the possibility of future V/STOL facilities and uses in the Bay Area should be acknowledged, but specific recommendations cannot be made at this time because of the uncertainties of its actual production and use." Accordingly, sites which were being considered as V/STOL airports were eliminated from the alternatives.

California Corridor

California Corridor traffic, the largest single air passenger market area for the Bay Area (37% in 1968), was considered as possibly warranting facilities separate from those serving other national or international markets. Its unique place in the Bay Area transportation picture also led to the review of possible alternate transportation modes - V/STOL and a high-speed ground transit system.* The final aviation plan recommendation, in response to the Corridor studies, included in it an airline airport at either Hamilton AFB or Napa County Airport to accommodate approximately 1 million passengers by 1985 and to serve primarily the Corridor traffic for the North Bay counties.

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* These possibilities were later rejected by the Committee - refer to "Additional Committee Actions" in Chapter IV.

Sacramento and Bay Area Traffic

As alternatives were narrowed in the last part of the study, joint use of Travis AFB remained a good possibility for recommendation. The Study Committee then heard testimony from the Director of Aviation for Sacramento County concerning possible airspace and passenger market conflicts with Sacramento Metropolitan Airport at certain development levels for Travis. An issue paper was prepared on this subject. It was supplemented by testimony from the FAA regarding airspace.* Using this information, the Committee limited the traffic levels for Travis to 1 million annual passengers by 1980 and 6 million by 1985. At these levels, no significant conflicts with Sacramento traffic would occur, and the activity could be accommodated at Travis without disruption of the Air Force mission at that base.

Airport Ownership

Finally, the problems surrounding airline scheduling, operational control, airport costs, and management and administration led to a paper discussing airport ownership and authorities. The issues raised were among the reasons for the establishment of a regional forum for continued communication and coordination of these problems.**

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* Refer to Chapter VII for this testimony.

** Refer to Chapter VIII for a discussion of this forum.

GENERAL AVIATION IN THE BAY REGION*

ASSUMPTIONS/ISSUES PAPER

INTRODUCTION

While there was not a separate report prepared in the Regional Airport Systems Study for general aviation, information about it appears in many of the technical reports prepared for the Regional Airport Systems Study Committee (RASSC).**

There has been a concern expressed that the study has not focused clearly enough on general aviation airports and aircraft operations. The purpose of this issue paper is to bring together the significant material on general aviation from the various reports, to identify the major assumptions used in developing the study material, and to present to the RASSC the issues that involve general aviation.

BRIEF ORIENTATION

General aviation (g/a) suffers from the negative definition usually used - "all aviation activity except airline and military aviation" - because that definition describes what it is _not_ rather than what it _is_.

General aviation includes a wide range of users:

- personal transportation
- business transportation
- commercial applications
    - aerial photography and mapping
    - construction support
    - aerial agricultural applications
    - news media
    - air taxi, charter, and rental
- recreational uses
    - soaring
    - skydiving
    - aerobatics
    - antique aircraft

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* Prepared for the Regional Airport Systems Study Committee February 8, 1972

** See the attachment to this issue paper for a summary of specific references to general aviation in each of the RASS reports.

- public safety
  - police
  - traffic reporting
  - fire fighting and surveillance
  - rescue
  - air ambulance
- educational
  - flight training
  - vocational training
  - experimental aircraft

What does general aviation mean with respect to a regional system of airports? What is its significance to the public of the Bay Region and its requirements for resources of the Region?

Long-standing arguments over general aviation and the provision of public facilities for its use range from:

A. It has a broad public benefit like a highway or golf course and should, therefore, not have to be financially self-sufficient.

to:

B. It benefits a very small group of wealthy people; its advantages are, for all practical purposes, not available to most citizens and therefore should not involve public ownership of facilities; or, if public ownership is involved, facilities should be financially self-sufficient, including recovery of all costs of land value, operating costs, and depreciation.

In actual application of public policy in city and county airport ownerships, we began after World War II with argument "A" and have, in recent years, moved closer to "B". This trend is evidenced by:

- state imposed user tax in the form of a general aviation fuel tax
- higher lease costs for commercial operators
- significantly higher aircraft storage fees
- higher flowage fees for general aviation fuel
- federally imposed users' charges to general aviation aircraft in the form of fuel tax and registration fee
- the change of stature from separate aviation departments of local government to a division of public works

Just what function general aviation has will be an important determination for the RASSC to make in order to judge its importance relative to other airspace and airport users, and to judge which aspects of general aviation are of a regional character and which are purely local in character.

A COMPENDIUM OF FINDINGS AND ASSUMPTIONS

Inventory

- Of the 34* airports available for public use in the nine-county region, 17 are publicly owned and 17 are privately owned.
- As of January 1, 1969, there were about 18,000 active licensed pilots in the Bay Area, about 0.4% of the total population.
- Many of the general aviation airports in the Region receive extensive use during busy days from aircraft not based at that airport.
- Of the 3,300,000 annual general aviation operations in the Bay Area in 1969, 1,900,000 (58%) were training flights that remained in the local airport control zone.
- Only one runway** being used exclusively by general aviation has an Instrument Landing System (ILS).
- There is significant use made of the airspace in areas over and adjacent to the Bay between flight altitudes 2500-3500' msl by g/a training under Visual Flight Rules (VFR).
- There were about 3,000 general aviation aircraft based in the Bay Area as of January 1, 1970.

Forecast

- About 11,000 g/a aircraft will be based in the Bay Area by 1985.+
- There will be 11 million annual g/a operations in 1985.+
- In certain parts of the Bay Region, there is today a constraint upon g/a aircraft ownership based upon the lack of convenient airport facilities. The forecast assumes a continuation of that constraint.

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* This number has been revised from the 35 indicated in the original Inventory Report to reflect the recent closing of Coddingtown, a private airport in Santa Rosa.

** Oakland, North Airport (another will soon be added at Sonoma County Airport in Santa Rosa)

\+ Refer to Appendix A for revisions.

Access

- The existing state and local highway systems provide adequate capacity for access to g/a airports in the Region.

- Only three cities, Richmond, San Pablo, and El Cerrito, are more than 15 miles from existing g/a airports.*

Economic Benefits

- The direct benefits from g/a airports would appear to accrue to the users.

- While employment levels at g/a airports may have local significance, they were too small to include in the Regional economic impact analysis.

Capital Cost

- To improve the existing publicly owned g/a airports to the ultimate development shown on their airport master plans would cost $21.4 million.

- To acquire and improve the privately owned airports at Fremont, Antioch, and Petaluma would cost $5.5 million.

- A new, large g/a airport in the Richmond area, located on Bayfill, would cost $17.8 million.

Environmental Quality

- If the 1985 demand of 11 million annual operations is achieved, general aviation would contribute about 70 tons of emissions per day. This is disbursed over the nine-county area and would be:
    - 2% of the estimated 1985 total emissions for the Bay Area**
    - 25% of the total 1985 aviation emissions for the Bay Area

- With the exception of airports accommodating regular business jet traffic, existing g/a airports would meet the proposed State of California noise standards for operating levels of 100,000 to 200,000 annual operations. Some airports would not meet those criteria above those levels.

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* If San Francisco Airport is considered as not being available for general aviation, then the City of San Francisco can be added to the three.

** This assumes that all automobiles will meet 1975 federal standards by 1985 and that no further improvement to today's aircraft engine will occur.

- Business jet traffic greater than 1% at g/a airports with more than 200,000 annual operations will extend the 30 NEF contour line beyond the normal property boundary of the airport.

- Development of a g/a airport at the Pt. Isabel site in Richmond is estimated* to involve 265 acres of Bayfill.

Capacity

- ILS facilities are available to g/a at Oakland North Airport and will soon be available at Sonoma County Airport. A report by the FAA** suggests additional ILS training capability at Half Moon Bay Airport and possibly at Tracy in San Joaquin County.

- The combined capacity of existing public use airports that have only g/a traffic is about 7 million annual operations.***

- If g/a airport development occurs as shown on the master plans, capacity would rise to about 8 million annual operations.*** This assumes the continued availability of the existing privately owned airports.

- If San Jose, Napa, Buchanan Field, and Livermore were to be used extensively for airline operations, a reduction in capacity available to g/a could occur.

ISSUES

The following are issues that relate to general aviation:

1. At airports where airline traffic exists, should airline traffic growth have precedence over general aviation traffic?

2. Should curfews or operational limitations be placed upon business jet aircraft for noise abatement?

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* By Bay Conservation and Development Commission (BCDC)

** No. California Committee for Airspace Utilization, Report of Task Group #7, January 1972.

*** Oakland North Airport is included, but San Jose and San Francisco are not.

3. Can the capacity of 8 million annual operations be stretched to accommodate the forecast of 11 million by redistributing the time of use, increasing the average delays, and dispensing with training flights during peak periods?

4. How will the capacity now provided by privately owned airports be assured for the future?

5. Can airspace be reserved for g/a VFR training areas?

6. What will be the effect of a Terminal Control Area on general aviation?

7. Will Oakland North Airport and Santa Rosa ILS's be sufficient for g/a instrument training?

8. Is it possible to justify new g/a airports in the urbanized parts of the Bay Area?

9. Who should fund improvements to existing or new g/a airports?

10. How do you distinguish between g/a airports with "regional significance" and those that are of purely local concern?

REFERENCES TO GENERAL AVIATION IN REGIONAL AIRPORT SYSTEMS STUDY REPORTS

Aviation Forecast: Pages 11-10 through II-13; Chapter VII

Airport and Airspace Capacity Analysis: Pages 4-27 through 4-33; Appendices E and F

Airport Access: Pages 3-44 through 3-48

Airport Inventory: Pages 16 through 19; Appendix B-2; Appendices D and E

Aviation Effect on Air Quality: Pages II-4 and II-5; III-15; IV-4 through IV-9; IV-13 through IV-15; V-6 through V-11

Aviation Noise Evaluations and Projections: Pages IV-30 through IV-43; IV-53 through IV-60

Capital Cost Analysis of Airport Alternatives: Sections of Chapter IV; Pages VI-5 through VI-8; VI-10 through VI-13

VERTICAL AND SHORT TAKE-OFF AND LANDING AIRCRAFT *

ASSUMPTIONS/ISSUES PAPER

INTRODUCTION

One of the technologies that the Regional Airport Systems Study Committee (RASSC) will have to evaluate is vertical and short take-off and landing aircraft (V/STOL). This evaluation is particularly important because the facilities requirements and their location are substantially different from those of conventional airplanes.

Three of the RASS technical reports refer to STOL; one involved airspace capacity, ** another forecast, *** and another capital cost. **** This paper has been prepared to review the STOL portion of these reports and to add to them some information from other technical sources.

BRIEF SUMMARY OF THE RASS REPORTS

The FORECAST report assumed:

- there will be no V/STOL application in the Bay Area before the 1980's
- between 1980 and 1985 a limited amount of V/STOL service may be introduced into the 100 to 400 mile markets
- no aircraft is economically viable with less than 95 seats

The AIRSPACE CAPACITY report said, with respect to various STOL site locations:

Concord - with proper coordination with Oakland, Alameda NAS, and Travis AFB, there would be no airspace restrictions on any existing airports

Livermore - no restrictions on any existing airports

Santa Rosa - no restrictions on any existing airports

Richmond - this site would seriously affect both the Alameda NAS departures and those of Oakland. The resulting conflict would also have an adverse effect upon the capacity of the Richmond site itself. Departure paths from Richmond would need to be restricted to avoid conflict with Hamilton AFB.

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* Prepared for the Regional Airport Systems Study Committee, March 17, 1972

** R. Dixon Speas Assoc., Airport and Airspace Capacity Analysis, Oct. 1971 (Phase II)

*** Systems Analysis and Research Corp., Aviation Forecast, May 1970

**** Bechtel, Inc., Capital Cost Analysis of Airport Alternatives, Oct. 1971

Pier 42 - there would be conflict between arrivals to Pier 42 and Alameda NAS departures, causing the traffic at the two facilities to be handled on a one-for-one basis. There would be a similar blocking of OAK departures.

San Carlos - if overflight of the communities to the west of the San Carlos airport were possible, * then STOL could operate there without restriction to any other existing airport.

The CAPITAL COST report said that the cost of providing for STOL ** at the following airports would be:

Place	Annual Passenger Capacity (millions)	Cost
Concord	2.4	$11,857,000
Livermore	1.2	9,454,000
Santa Rosa	7.5	11,200,000
Richmond	4.4	34,136,000

OTHER SOURCES OF INFORMATION

Attached to this paper is a select bibliography of other sources of information about V/STOL. Those that apply to the Bay Area are summarized as follows:

NORCALSTOL *** - A STOL advocacy group formed by the San Francisco Chamber of Commerce and under contract to NASA Ames Laboratories, completed a study of Bay Area STOLport locations. Their report investigated the following STOLport sites:

1. Central Bay (a floating structure north of Treasure Island and west of the Berkeley Marina)
2. Treasure Island
3. Crissy Army Airfield, Presidio
4. China Basin, San Francisco (Southern Pacific yards)
5. Mission Rock, San Francisco (Piers 48-56 area)
6. India Basin, San Francisco (north of Hunter's Point, Butchertown Redevelopment Project
7. West Oakland (near the new Postal Distribution Center)

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* Noise considerations have recently led to an additional concept in this type of aircraft - Quiet Short Take-off and Landing (Q/STOL)

** These estimates include a varying amount of general aviation capability as well as STOL

*** See bibliography, number 7

The report presumes that STOL is necessary and concentrates on seven sites that have a high "site opportunity." The report's purpose is "to provide an information resource for local community groups in San Francisco and Oakland. It will enable them to evaluate the problems and opportunities, costs and benefits of having a STOLport as a neighbor..." (page 3)

UNITED AIRCRAFT RESEARCH LABORATORIES * - This report showed that nine of the Bay Area's helicopter routes could demonstrate viability without subsidy.

McDONNELL DOUGLAS ** - This report studied the use of a four jet-engine STOL airplane of 100 to 200 passenger capacity operating between the Bay Area and Los Angeles. The 125,500 to 233,600 pound airplane was studied for use at Crissy Army Air Facility, Oakland, and San Carlos.

BOEING CO. *** - Under contract to NASA Ames Laboratories, Boeing conducted a study of V/STOL in intra-urban service in the Bay Area. None of the systems studied was capable of covering other than the direct cash operating costs. Even with 2/3 federal funding of the capital investment, local subsidy would be required.

SPUR **** - SPUR completed an analysis of the NORCALSTOL report and concluded, "If a permanent short take-off and landing airport is required to serve the central part of the Bay Region, such a facility would be best located in Oakland, just south of the Bay Bridge. Because of the compact, tightly-knit and mixed-use characteristics of San Francisco's urban development, there is no place in the city for a STOLport. An experimental project to demonstrate the potential importance and viability of the STOL concept should be designed with the most favorable conditions, so the case is not stacked against STOL. To guarantee this, the demonstration should await the commencement of BART operations, and should take place at the Alameda Naval Air Station..." (page 1)

BCDC ***** - The "Possible Bay Planning Conclusions" regarding V/STOL were: "V/STOL ports and heliports to serve the airports, intra-regional and short-haul traffic (e.g. Sacramento, Stockton, Monterey) will be needed close to most or all major population and commercial centers. Such facilities need close proximity to the center served, access to the local transportion system and to parking, and special attention in site selection to minimize the noise problem to the immediate surrounding area..."(page 1)

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* See bibliography, number 10

** See bibliography, number 6

*** See bibliography, number 4

**** See bibliography, number 9

***** See bibliography, number 3

ISSUES

Unlike existing aviation services, the V/STOL concept is, for all practical purposes, just that - concept. The Committee should not take V/STOL as a "given" but should review the following issues for "truths" which can indicate the extent to which facilities may be needed.

That the "truths" about V/STOL are still greatly open to evaluation can be seen from the wide variation of opinion shown in the following quotes from press sources:

> " A CAB planning study issued by the Bureau of Economics said that existing aerospace technology can bring about commercial STOL service in the early 1970's and VTOL service by 1980. The study cited an industry consensus of opinion that the country's short-haul transportation system will begin with STOL aircraft, evolving gradually to the ultimate establishment of a VTOL system...Despite some of the rosy predictions, buried at the back of the study is a capsule account of the biggest obstacle to date: uncertainty by all parties on where V/STOL as an air transport system is headed. Development of STOL and VTOL ports appears tied up in political and economic considerations... because 'civil authorities are reluctant to commit high-priced land areas and expensive construction costs for a transportation system that does not exist and for which the outcome is in doubt'..."

Aviation Daily, March 30, 1970, page 182

> " FAA has proposed development of a Vertical Short Take-off and Landing short haul system that will serve the city center or other major urban sites with significant percentages of origin/destination traffic. We have proposed that this system be initiated as soon as possible at a level the present state of the art will support. FAA is convinced of the need for and the acceptability of a V/STOL short haul service."

Aviation Daily, April 16, 1971, page 276

> " Difficulty in expanding aviation facilities in New York, the heart of the Northeast Corridor, was the main factor in the elimination of STOL and VTOL from consideration for massive federal investment during the current decade...Problems with ground access to existing airports will increase, and would do so drastically if V/STOL were utilized. With most of the flights moving during the usual peak-hour periods, total travel time by air would become unacceptably long because of ground as well as runway and airway delays... There is no possibility of moving V/STOL operations from existing airports to mid-city locations because of local opposition based on noise, pollution, and safety factors... Passenger acceptance of VTOL at this time was also considered doubtful..."

Aviation Week and Space Technology, October 4, 1971, p. 31

" Prospective passengers and the general public - two overlapping groups that usually were not considered until much later phases - are now being looked upon as dominant design limitations in the development of a viable vertical or short-take-off and landing (V/STOL) transport system... Airlines interested in STOL aircraft for shorter-haul city-center routes ran into difficulties long before they got to technological problems. Initial proposals met adamant and intense public opposition."

Aviation Week and Space Technology, March 6, 1972, p. 21

" Despite talk of quiet, short haul, low density STOL aircraft development, the market for such aircraft seems questionable. None of the 161 commuter carriers serving short haul, low density markets - and receiving no subsidy - could afford in the foreseeable future the multi-million-dollar aircraft envisioned by manufacturers."

Aviation Daily, January 24, 1972, page 121

These then, are the issues:

1. What transportation functions can V/STOL perform?

2. Does V/STOL provide a unique service not available to the public in other transport modes or combinations of modes?

3. Is the "uniqueness" of V/STOL benefits sufficient to warrant a sizeable investment in public and private resources for this technology?

4. What are the characteristics of the V/STOL vehicle necessary to perform the service?

5. Can the V/STOL vehicle be compatible with existing communities?

6. Can the flight characteristics of the V/STOL vehicle aid in sound abatement at existing airports?

7. Will V/STOL application cause negative airspace capacity effects upon existing airports?

8. If V/STOL is a viable system, when will facilities need to be provided, where, and by whom?

9. Will BART connections to the existing or future airports do a "better" job of door-to-door transportation for the public?

10. Would the Department of Transportation conclusion that STOL would have only a limited application in the Northeastern part of the U.S. in the 1980's apply also to the Bay Area.

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THE CALIFORNIA CORRIDOR
SAN FRANCISCO BAY AREA TO SOUTHERN CALIFORNIA*

ISSUE PAPER

INTRODUCTION

In discussing airline passenger service in the Bay Area, the Committee has had occasion to refer to the California travel corridor between the San Francisco Bay Area and Southern California. It is the largest single air passenger market area for the Bay Area (37% in 1968 with Portland/Seattle next at 9%) and is the one that has the greatest effect on the existing airports, and potentially on future airports. Because of this, the Committee has requested that a separate review of that corridor be prepared.

- The Corridor has the largest volume of air passenger traffic of any single corridor in the world- 6.7 million passengers in 1971.**

- It is the largest single market from the Bay Area- 37% in 1968 (5.9 million annual passengers), and estimated to be 35% of the RASS forecast of 72 million passengers in 1985, or 25 million passengers.

- In October 1970 *** there were 1,061 weekly aircraft departures from the Bay Area to Southern California:

636	from SFO
220	from OAK
205	from SJC
1,061	

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* Prepared for the Regional Airport Systems Study Committee, April 3, 1972

** Twelve months ending September 1971. California PUC form 1504.23

*** Official Airline Guide, October 15, 1970.

- PSA is the only airline that serves all three Bay Area airports-SFO, OAK, and SJC-and the Los Angeles International Airport. In 1970, PSA carried: *

	Total PSA Passengers	% of PSA Passengers	Approximate Number of Daily Flights Available
SFO/LAX	1,005,880	45	13
OAK/LAX	638,513	28	8
SJC/LAX	621,958	27	9
	2,226,351	100	

- In the total two-way movement of people in 1966 in the Bay Area/Southern California corridor, it has been estimated that: **

6,700,00 went by auto (57%)
200,000 went by bus
100,000 went by rail (1%)
4,800,000 went by air (42%)

- By comparison, it is estimated that the Los Angeles/San Diego corridor generated 47,000,000 people-trips in 1969, 92% of whom went by automobile.***

- In 1970 and 1971 when the U.S. domestic trunk airlines were experiencing a reduced enplaned passenger growth rate (a 2.7% decline in 1970 and 1.8% increase in 1971), **** the two California intra-state carriers, PSA and Air California, experienced a growth of 9% and 12% respectively. *****

- The effect of service in the corridor on traffic generation from a community may be exemplified by the introduction of PSA service between San Jose and Los Angeles in May 1966. ******

	Annual PSA Passengers	Total SJC Passengers
1965	-	126,247
1966	258,454	416,850
1967	578,550	714,680
1968	727,830	1,071,434
1969	(figures not available)	1,565,143
1970	"	1,595,153
1971	"	1,704,748

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* California Public Utilities Commission

** California Department of Aeronautics

*** McDonnell Douglas Corp.

**** Air Transport Association, Air Transport, 1971.

***** Aviation Week

****** Civil Aeronautics Board Docket No. 51194, Exhibit SJC-13, SJC-14: also current airport records

- The Sacramento experience in the Los Angeles market was a dramatic jump in passengers upon the introduction of low-cost intra-state service: *

Sacramento to Los Angeles

One Way Lowest Fare Propeller	Jet	Year	Total Annual Passengers	United Airlines & Western	PSA
-	-	1965	228,930	228,930	-
$20.45	$24.75	1966	248,960	248,960	-
13.33	15.24	1967	478,559	280,680	197,879
-	15.24	1968	521.768	232,779	288,989
-	16.19	1969	559,793	210,190	349,603

STATEMENT OF ISSUES

- Do additional airport service points need to be provided in the Bay Area to connect to the Corridor?
- Will STOL-type aircraft be able to compete in the Corridor with conventional aircraft?
- How plausible is a high speed ground system connecting the Bay Area to Southern California? When might it be available?
- While new service points to the Corridor traffic could reduce ground access traffic,

    (1) they might not significantly reduce aircraft operations at existing airports.
    (2) they may increase the complexity of the airspace.

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* Roy Gilfix, Analysis of the Adequacy of Air Service at Sacramento California, March, 1971. Also current airport records and Official Airline Guides.

RELATIONSHIP BETWEEN SACRAMENTO AND THE BAY AREA AIR TRAFFIC AND PASSENGER MARKET

ISSUE PAPER

INTRODUCTION

The RASSC has recently received comments from Sacramento County's Director of Aviation concerning the effects upon mutually shared airspace and passenger markets if the Bay Area were to identify a future joint civil/military use for Travis AFB. The County's plans for Sacramento Metropolitan Airport involve expansion from today's 1.5 million annual passengers and 42,000 operations to 9 million passengers and 220,000 annual operations by 1990. The RASS alternatives to date would identify Travis as having a civilian use of:

	Annual Passengers (millions)	Annual Operations (thousands)
in 1980	3	39
	5	59
in 1985	7	70
	13	130
	18	180
	24	240

This paper will review information prepared for the Committee on airspace and will provide some staff evaluations on the passenger market areas.

AIRSPACE

1. In their Phase 1 report, Speas identified the Sacramento airspace as being the most complex and heavily loaded in 1969, but still well below that requiring any special attention. In the future loadings of two million airline, military and general aviation operations into the 100-mile-square controlled airspace around the Bay Area, there were several areas that could become very heavily loaded - of which Sacramento was one. ** Based on alternative procedures and new technology, Speas concluded these could be satisfactorily handled and that transition and enroute airspace would not be a limitation in the Bay Area up to two million operations annually.

2. In the analysis of Travis AFB in their Phase 11 report, Speas identified the major airspace conclict to be in the area south west of Travis and to involve Napa and Concord operations. Speas concluded that these conflicts could be procedurally resolved with altitude separations and use of Runway 14-32 at Concord for departures. Based on this determination, Speas concluded that Travis could, with a new runway (5000' separation) and joint use of all three runways, accommodate;

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* Prepared for the Regional Airport Systems Study Committee, May 26, 1972

** The others were Woodside (the most serious), Salinas, Los Banos, Decoto, Half Moon Bay, and Mt. Hamilton

Hourly Capacity		
Practical	VFR - 121	
	IFR - 121	
Peak	- 147	
Annual Capacity		
Military		- 121,000 operations
Civil		- up to 430,000 operations

3. Travis, with civilian traffic, was not a part of the FAA's analysis done by the National Aviation Facilities Experimental Center. *

4. "Operations within the Sacramento terminal area are primarily generated by four airports, ie. Metropolitan, Executive, McClellan AFB and Mather AFB. Although Travis AFB is located outside of the designated Sacramento Terminal area, its air traffic may receive direct routings through the Sacramento area and as such must be considered as part of the Sacramento complex; traffic associated with Yuba County Airport and Beale AFB create minimum air traffic information."

   (p.4-1**)

   "Although turbojet aircraft enroute to or from San Francisco Bay Area airports are normally at relatively high altitudes, a significant volume of turboprop and piston aircraft pass through the study airspace at or below 10,000 feet. Allocation of airspace for this traffic has a quantitative effect upon area operations." (p. 4-1**)

   "In order to more efficiently handle increased traffic volumes in the future, and to effectively implement improved terminal area traffic flows, it is recommended that Travis and McClellan RAPCONS be combined into a single control agency with control boundaries adjusted to meet terminal air traffic airspace requirements. This will have a further benefit of facilitating tower enroute service between Sacramento and the Bay Area."

   (p. 4-6**)

   "The 1990 forecast demand for these airports may not necessarily reach these high IFR levels, in which case the complexity ratings will be on the high side. However, as will be shown, even at these high rates the resultant complexities leave little doubt that, with minor route modifications, Sacramento Metropolitan and Sacramento Executive traffic can be absorbed within existing airspace."

   (p. 4-18 **)

   "It is apparent that southbound traffic out of the Sacramento area may have to be routed east of the Linden/Stockton area, or tunneled under the Oakland-San Francisco east-west traffic. Additional corrective action would result with greater dispersal of routes which currently converge on both Linden and Stockton. In addition, the current practice of routing Bay Area traffic over Sacramento would be undesirable with the Sacramento Airport system operating at high and "by-pass" routing should be established for Bay Area traffic.

   The transitional airspace relating to the Sacramento area will be able to support both the system increase and local traffic increase to the 1990 period with little required modification of existing route structure."

   (p. 4-20**)

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* O'Brien, Paul J., A Dynamic Simulation Study of Air Traffic Capacity in the S.F. Bay Terminal Area, August 1971

"#2. Bay Area "by-pass" routes should be established to prevent intermixing the low performance (low altitude) category of this traffic with Sacramento area arrival/departure activity.

#5. Congested airspace and lack of maneuvering area east of Metropolitan Airport, resulting from the McClellan/Mather AFB complex, will inhibit, to some extent, the ultimate capacity of the airport.

#7. Beale AFB, Yuba County and Travis AFB are sufficiently separated from the Metropolitan, Executive, McClellan AFB and Mather AFB complex to permit those facilities to operate independently.

#8. Any future development of IFR capabilities in the area (establishment of new IFR airports or conversion of existing VFR fields to IFR), must be carefully evaluated as to effect on existing systems."

(p.2-1 **)

5. The FAA Airspace Utilization Committee's rewiew of the question of conflict between joint military/civil use of Travis found: "However, the study revealed that with some significant changes in the use of this airspace and with possible provision of some additional navigational aids, the Travis AFB operations as identified" (up to 404,000 civil instrument operations per year) "could be accommodated from an airspace use standpoint..."

** R.D. Speas., <u>Sacramento County Airspace and Airport Capacity Analysis</u>, February, 1971.

Shared Passenger Market

The question raised by Sacramento with respect to shared passenger market involves two issues (1) which passengers now using Sacramento Metropolitan Airport (SMF) would be diverted to Travis, and (2) if Travis is a large regional airport, wouldn't it eclipse SMF's ability to obtain and/or retain airline service to multiple locations.

Starting with the first of these issues, staff has prepared a table of travel times from various cities in the potential shared market area to the various airports.

TABLE 1

GROUND TRAVEL TIMES
(1980 Highways)

Central Business Districts Of:	Airports SMF*	TRAVIS	OAK	SFO	SJC
Fairfield	58	11	84	102	107
Napa	72	36	57	75	86
Vallejo	77	41	45	64	76
Benica	77	41	49	69	69
Concord	87	50	44	64	64
Antioch	80	65	27	46	61
Pittsburgh	86	55	45	65	65
Walnut Creek	95	54	37	57	57
Richmond	92	63	31	49	64
Vacaville	43	28	63	82	87
Davis	22	29	100	113	124

* These are based on map distances at 50 mph via 1-80, State Routes 113 and 16.

From the unpublished survey of California airline passenger origins and destinations * the following estimates were obtained:

TABLE 11

SOLANO COUNTY/LOS ANGELES COUNTY..........	71,400	annual passengers
...through LAX		
SFO-LAX	46,000	annual passengers
OAK-LAX	14,500	
SMF-LAX	2,500	
subtotal	63,000	
...through Hollywood/Burbank		
SFO-BUR	2,700	
OAK-BUR	2,300	
SMF-BUR	0	
subtotal	5,000	
SOLANO COUNTY/PORTLAND, OREGON............	17,300	annual passengers
...through Portland		
SFO-PDX	13,200	
OAK-PDX	4,100	
subtotal	17,300	
SOLANO COUNTY/RIVERSIDE COUNTY.............	4,150	annual passengers
SMF-ONT	1,070	
all Bay Area-ONT	3,080	
subtotal	4,150	
NAPA COUNTY/LOS ANGELES COUNTY............	23,200	annual passengers
...through LAX		
SFO-LAX	4,700	
OAK-LAX	7,200	
subtotal	11,900	
...through BUR		
SFO-BUR	2,700	
OAK-BUR	4,900	
subtotal	7,600	

* Daniel, Mann, Johnson and Mendenhall, for the California Dept. of Aeronautics

NAPA COUNTY/LOS ANGELES COUNTY continued

...through ONT

SMF-ONT		1,800 annual passengers
SFO-ONT		600
OAK-ONT		1,000
	subtotal	3,400

CONTRA COSTA COUNTY/LOS ANGELES COUNTY...251,200 annual passengers

...through LAX

SFO-LAX		59,300
OAK-LAX		136,600
	subtotal	195,900

...through BUR

OAK-BUR		41,200
	subtotal	41,200

...through ONT

SFO-ONT		1,600
OAK-ONT		6,600
	subtotal	8,200

SACRAMENTO COUNTY/LOS ANGELES COUNTY.... 352,000 annual passengers

...through

SMF-LAX		283,000
SFO-LAX		9,600
SCK-LAX		500
	subtotal	293,100

...through BUR

SMF-BUR		40,200
OAK-BUR		1,200
	subtotal	41,400

...through ONT

SMF-ONT		15,700

SACRAMENTO COUNTY/CENTRAL REGION..........61,400 annual passengers
OF USA

via SMF		53,800
SFO		7,400
SCK		200
	subtotal	61,400

SAN JOAQUIN COUNTY/LOS ANGELES COUNTY.........36,900 annual passengers

...through LAX		
SMF-LAX		13,600
SFO-LAX		700
OAK-LAX		5,800
SCK-LAX		15,700
	subtotal	35,800
...through BUR		
SJC-BUR		1,200

TABLE 111

Principal Airports Relationship to SMF (Sacramento)

SMF and LAX	492,800	annual passengers
SFO	80,600	
eastern U.S.	67,000	
central U.S.	73,000	
BUR	49,000	
So. West U.S.	33,000	
PDX	32,600	
Las Vegas (LAS)	21,000	
Phoenix (PHX)	14,000	

Based upon this information the following is concluded:

- that for a low level of service at Travis (say 2-5 million annual passengers), primarily to southern California and maybe Portland/ Seattle, the diversion from SMF to Travis for San Joaquin, Contra Costa, Solano and Napa and Sacramento counties would not seem to be large.

- a higher level of traffic at Travis, however, would raise the question of limiting the kind of non-stop service that might be certificated to both Travis and SMF. From the RASS access work, we know that to increase Travis above about 5% of the Bay Area total traffic, specific airline service would have to be assigned there. If that were done, it may impinge upon Sacramento's ability to obtain similar service, or, if SMF had already obtained the service, would impinge upon the ability of Travis to obtain the service.

ISSUES

1. The level to which joint-use of Travis could be negotiated with the Air Force is not known, beyond the current agreement with Solano County.

2. Airspace does involve specific coordination with the Sacramento area.

3. Ground access is a major question which does involve both Travis and SMF, particularly the question of future transit extensions between the Bay Area and Sacramento.

4. Because Sacramento is the State capital, airline service that may predate Travis will probably not be removed from Sacramento.

A REVIEW OF AIRPORT OWNERSHIP*

ISSUE PAPER

INTRODUCTION

To date, the development of airports serving the Bay Region has been performed by the individual cities of San Jose, San Francisco, and Oakland. Issues before the Committee with respect to restructured airline service points, new remote airports, and major additions to existing airports raise the question of the future form of ownership for airports serving the Region.

This paper is a brief summary of the principal forms of airport ownership and their advantages and disadvantages.

AIRPORT OWNERSHIP

In the early days of aviation, both general aviation and airline airports were often developed with private capital. Two of the three major airline airports in the Bay Region began as either privately owned or developed airports - Mills Field (now San Francisco International) and San Jose City Airport (now San Jose Municipal). California now has 34 airline airports, only one of which is in private ownership - Hollywood/Burbank Airport. Of the 352 airports in the state, 142 are privately owned and 210 are publicly owned. Of the total 34 airports open for public use in the nine-county Region, 17 are in public ownership. All of the airline airports in the Region are now publicly owned.

Today the actual ownership and operational control of the publicly owned airports in California generally fall under one of the following forms:

1. A separate department of city or county government: San Jose Municipal, Kern County Department of Airports.

2. A division of a public works or transportation department: Buchanan Field, Santa Clara County, Fresno.

3. Special airport districts (provided for in Section 22001-22908 of the State Public Utilities Code): Monterey Peninsula Airport, Truckee-Tahoe Airport, Santa Maria.

4. Independent commissions, ports, or authorities: San Francisco, Oakland, Los Angeles, San Diego.

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* Prepared for the Regional Airport Systems Study Committee May 12, 1972.

FINANCIAL RELATIONSHIPS

The type of public ownership has a great deal to do with the financial self-sufficiency of the airport. Generally, the airports that are capable of revenue financing their own capital improvements and of meeting their operating costs are independent of direct city or county control.

Others, that are dependent to some extent upon general tax funds, remain as departments or divisions of departments of local government.

Where a broader tax base is required, the special airport districts can serve that purpose.

The following is an insight into the extent of self-sufficiency:

- small general aviation airports (less than 200 based aircraft) are usually dependent upon the local tax base for funds for capital, maintenance, and operating expenses.

- large general aviation airports (greater than 200 based aircraft) and small airline airports (less than 500,000 annual passengers) will be able to generate revenues to support minor maintenance and all operating costs. For the larger airports in this group, some capital expenses may be covered by revenues if federal <u>and</u> state grants-in-aid are applicable.

- medium to large airline airports (greater than 500,000 annual passengers) will have sufficient revenue to be self-sustaining. The larger airports will have revenue flows that will allow capital expenditures outside of grant-in-aid programs and allow flexibility in action.

REASONS FOR INDEPENDENT AIRPORT AUTHORITIES*

- the aviation service area is geographically different from any existing political boundaries.

- there is a limitation on local government's ability to pay for or finance an airport.

- the specialized skills needed to manage and administer an airport may be beyond the capability of local government.

- independence from local governmental elective processes allows airports to affect long-term programs.

- it is a solution to rivalries among conflicting governments.

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* Dygert, Paul K., <u>Some Economic Aspects of Airport Boards, Authorities, and Districts</u>. University of California, 1963.

The reasons stated above can begin as advantages during the early airport development and later become disadvantages. Among these disadvantages are the lack of responsiveness to the adjacent communities concerning adverse effects of the airport operations and the lack of governmental review of all the government's revenues sources in determining community expenditure priorities.

ISSUES

In the Regional Airport Systems Study, these issues may be important:

1. A once-existing rivalry among present airports is reduced in the long-term by the expected abundance of future demand.

2. Any major new regional airport such as Travis or Eastern Contra Costa County will need a broadly-based political, administrative, and financial source to implement it. Who and how would that be done?

3. How will regional airport planning, now being provided by ABAG, be coordinated in the future with other transportation planning being done by MTC?

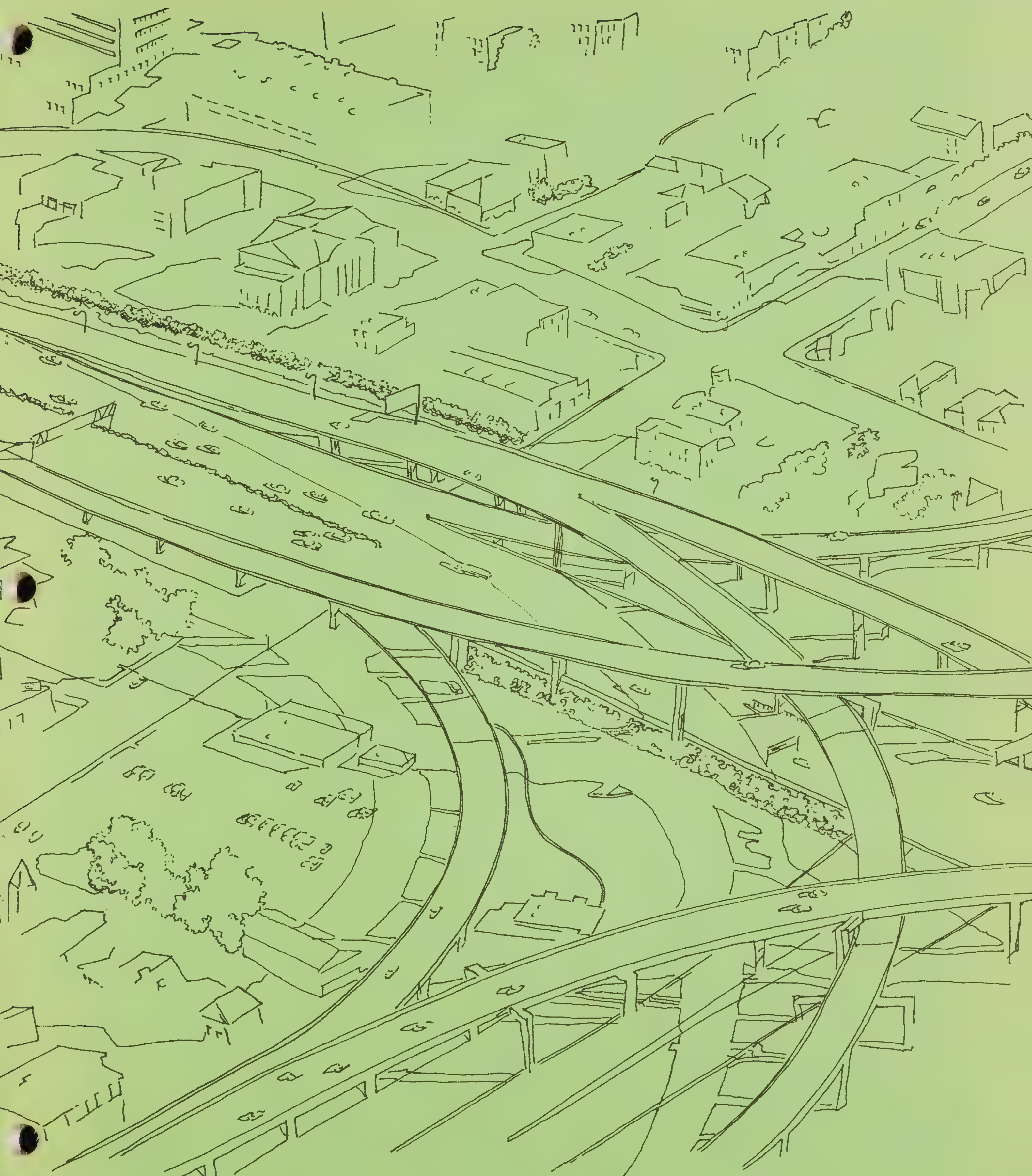
4. Is there any need to governmentally join the existing airports?

5. Should a new regional airport be separate from the existing airports - governmentally, financially?

6. Many of the general aviation airports in the Bay Region have and will increasingly have an importance to the Region beyond the local owner's political jurisdiction. Should some way be devised to share responsibilities for capital improvements and the creation of new general aviation airports?

7. If an ongoing process is required to insure the implementation of the Regional Airport Plan, who establishes the process and administers it?

8. The Association, by its Resolution No. 1-71, has adopted a policy that opposes the creation of additional special purpose districts and authorities.



IV-Goal, Policies, and Decision Criteria

CHAPTER IV

GOAL, POLICIES, AND DECISION CRITERIA

The Association of Bay Area Governments' Regional Plan 1970:90, approved by the Association on July 30, 1970, was used as a reference in the Regional Airport Systems Study goal and policy work. In looking at the Regional Plan, the Committee found that:

- Population levels of 4.8 million for 1970, 6.2 million for 1980, and 7.5 million for 1990 were projected.

- The Regional Plan proposed a city-centered Bay Region.

- The adopted planning goals are:

  1. To protect and enhance San Francisco Bay and the major physical features and environmental qualities for the Region.

  2. To provide the opportunity for all persons in the Bay Area to obtain adequate shelter convenient to other activities and facilities, in neighborhoods that are satisfying to them.

  3. To designate ample land and facilities for the economic growth of the Region in order to provide opportunities for all citizens and communities to improve their economic well-being.

  4. To provide a transportation system that is integrated with land use and consistent with the city-centered concept of regional development.

  5. To provide a permanent regional open space system that makes possible the range of activities essential to the city-centered concept of regional development.

  6. To create a sense of regional identity, responsibility, and cooperation among citizens, organizations, and governments in the Bay Area.

- The Regional Plan stated that for airports, "The designation and use of land for these purposes should directly support the objectives for a city-centered Region."

- With respect to environmental quality, measures should be taken to:

  1. Halt the unnecessary use of limited natural resources.

  2. Restore and replenish them whenever and wherever possible.

  3. Provide improved environmental conditions.

The Regional Plan was intended to be a general guideline for the Region. The specifics of its features have been left to its special plan elements. The Regional Airport Systems Study Committee looked at both the Regional Plan's guidelines and the findings of other special plan elements - water and sewer and open space. It then developed three levels of detail to define the aviation plan element:

First level: the general goal

Second level: some more specific policies to reach the goal

Third level: the very detailed decision criteria developed to allow the Committee to choose specific airport alternatives

These levels are included in detail in this chapter.

An issue that was raised during the review of the Regional Plan and several times during the public hearings was whether or not the growth to 7.5 million people in the Region by 1990 could be accommodated in a city-centered concept "reasonably well" and maintain "environmental quality." Concerned with this problem, the Committee asked ABAG's General Assembly in February 1972 to review its urban growth assumption in light of the 1970 census and some more recent specific environmental constraints. Until this re-evaluation can be made, the Committee adopted for its use in projecting passenger numbers the recent Department of Finance population forecast, made since the Regional Plan was written and lower than the Regional Plan assumes.

In employing the policies and criteria, the Committee often found conflicts:

- To avoid noise, high capital costs and air emission levels were encountered.

- To increase capacity, Bay fill was required.

- Increased access distance improved some environmental effects, but reduced probability of use by the public.

By applying the criteria to the various alternatives and selecting among the alternatives, the Committee in effect established its priorities among those which conflicted.

GOAL AND POLICIES

The PRIMARY GOAL of this study is to determine a system of airports to serve the San Francisco Bay Region.

To accomplish this goal, the Committee will consider three broad, long-range public needs among which priorities will have to be set: Aviation Transportation and Services, Economic Vitality, and Environmental Quality.

Aviation Transportation and Services

Under Aviation Transportation and Services, the Committee recommends these POLICIES for assessing each alternative:

Airport and Airspace Potential

1. Provide and allocate airport capacity and support facilities for a range of demand a) at a reasonable level for users with b) minimum airspace conflict and c) minimum delay.

2. Encourage air safety.

3. Set airspace and airport use priorities among users based upon public safety and benefit.

4. Provide users with a choice of airports for destinations and available service.

Access To, From, and Between Airports in the Region

1. Provide the highest ground access service level, modal flexibility (auto, bus, air taxi, transit, STOL) and choice to the full range of airport users at a minimum cost.

2. Match ground access capacity to airport use.

Economic Vitality

Under Economic Vitality, the Committee recommends these POLICIES for assessing each alternative:

Impact

1. a) Provide new investment opportunities where growth and employment are desired and feasible.
   b) Capitalize on existing investments, public and private, where further growth and employment are desired.

2. Provide employment income to a wide range of Bay Area residents.

Cost

1. Minimize public and private capital investment for airport facilities to meet a demand level agreed upon.

2. Make direct economic benefits exceed direct economic cost.

Environmental Quality

Under Environmental Quality, the Committee recommends these POLICIES for assessing each alternative:

Noise

1. Reduce aircraft noise over sensitive and populated areas.

2. Reduce noise exposure by correcting incompatible uses.

3. Reduce noise by establishing a long-range planning program.

4. Prevent the creation of new incompatible land uses.

5. Disallow waivers on noise compatibility for new airport sites.

Air Quality

1. Avoid establishing new airport and ancillary activities (including access) where they would contribute significantly to pollution of known high potential pollution areas.

2. Avoid increasing aviation and ground access activity in areas where the total air pollution would be significantly increased.

3. Reduce existing pollution by correcting incompatible uses.

4. Encourage compatible uses.

Water Quality

1. Assure that any present, new, or expanded airport development meets State Water Quality Control Board standards.

Surface Use

1. Provide for maximum safety between aviation activity and other land and water uses.

2. Minimize Bay fill.

3. Assure compatibility of airport operations with public parks, recreation areas, wildlife sanctuaries, habitats of unique species, and aesthetic features where appreciable adverse effects are likely to be long-term or irreversible.

AVIATION FORECAST DECISION CRITERIA

Adopted May 5, 1972

Passengers: The Regional Airport Systems Study Committee adopts the projection of 28 million total annual passengers for the year 1975, 44 million for 1980, and 72 million for 1985. This is based upon the most recent State Department of Finance projections of population for the Bay Area. The same per capita employment and per capita income values were applied as were used by the RASS contractor.

Cargo: The RASSC adopts the cargo projection which results from modifying the contractor's projection downward to reflect the smaller population of the DOF forecast. The values for total cargo enplaned and deplaned in the Bay Area are then as follows:*

Pounds (000)	1975	1980	1985
RASS Modified Projection	1,454,000	3,163,000	6,690,000
Original SARC Projection	2,006,109	4,619,500	9,371,437

Mail: The SARC forecast for mail used growth rates developed by the RASS contractor in consultation with the U.S. Postal Service. The RASSC adopts this projection.

Load Factor: The seat load factor used in planning for 1985 for the average day of the peak month is increased by the RASSC about 30% - from 47% to 60%. This will mean the following average number of passengers per flight operation:

1975	1980	1985
65-70	80-85	95-100

(the lower figure in each case is for airports where 747 type aircraft are not in use)

* Includes connecting traffic. The RASSC takes note of the contractor's statement about the lack of detailed information regarding local cargo origin and destination and recognizes that the procedure for assigning the Bay Area total cargo forecast to county origin and destination is to be used with caution.

It is recognized by the RASSC that a 60% load factor may cause some passenger inconvenience.

The weight load factors used in the all-cargo aircraft remain unchanged, but the proportion of cargo carried on all-cargo flights in 1985 is revised downward from 85% to 60% with the difference picked up by increased weight load factors on combination passenger/cargo flights.*

General Aviation: Based on the revised population projections for the Region, general aviation projections for the Region are as follows:

	1975	1980	1985
Ownership	5,680	7,590	9,860
Annual Operations	4,600,000	6,700,000	9,200,000

* The proportion of all-cargo flights could change from this projected figure if a major breakthrough in cargo transport occurs before 1985.

ACCESS DECISION CRITERIA

Adopted May 5, 1972

1. No airport alternative shall be chosen unless an acceptable passenger allocation process will provide for substantial utilization of the capacity of that alternative.

2. If actions by regulatory agencies are necessary to provide for the utilization of an airport's capacity, then coordination between the Bay Area airport plan and that agency shall be undertaken.

3. For airports with substantial passenger traffic, transit connections to the airport will be included.

4. Where future highway use restricts airport access, substantially increases airport ground travel times, or results in uncertainty for the air traveller, a much higher proportion of the passengers will choose BART than that suggested by the consultant. In such a case, direct transit connections must be capable of handling this additional traffic.

5. In the selection of an airport alternative, airport access roads and parking and/or transit must be capable of handling the airport capacity. The availability and convenience of vehicular access is a major determinant of airport choice.

6. Within the constraints of safety and public financial feasibility, the public shall take precedence over the convenience of airlines in determining the allocation of passengers among airports.

7. Capital cost of that portion of highway and transit extensions which uniquely serve an airport shall be an allocated cost of that airport alternative.

8. All portions of the Bay Area shall have access to a general aviation airport within at least 40 minutes ground travel time.

9. Transportation capacity must be available to accommodate mail and air freight traffic for each airline airport.

10. By 1985, 80% of the passengers in the 31 external market segments will have at least two service points in the Bay Region.

AIRSPACE AND RUNWAY CAPACITY DECISION CRITERIA

Adopted May 19, 1972

1. The assignment of airspace priorities shall recognize today's operating levels at military airports.

2. Where joint-use of military airports is being considered, the military mission capability must be preserved.

3. Where airspace conflicts may occur, airports with region-wide significance will have precedence.

4. Air traffic routings and procedures will take optimum advantage of aircraft noise reduction procedures.

5. Procedures must be developed to prevent over-scheduling of the air traffic system during peak-hour periods.

6. Airline, military, and general aviation flight training shall be diverted away from critical airports during periods of peak traffic.

7. Airspace which is restricted for military purposes should be returned to civilian control when not in use.

8. Full advantage shall be taken of new technology in area navigation, two-segment approaches, computer aided sequencing, and digital displays.

9. The establishment of terminal control areas (TCA) will be the minimum necessary to assure safety and will provide for adequate VFR flight into and out of the Bay Area.

10. All airport development plans shall be coordinated with the Federal Aviation Administration, ABAG, and any other appropriate regional agencies.

11. The scheduling of flights and the utilization of airport and airspace control facilities shall reflect the higher utilization noted in the 60% average seat factor guideline adopted by the RASSC.

AVIATION NOISE DECISION CRITERIA

Adopted May 5, 1972

1. The Committee should use the land use interpretations shown on the following figure as the basis for determining airport/community relationship. Of these, the interpretations for residential relationships are comparable to the State of California's proposed noise regulations for the year 1985.

2. Actions by the FAA, airlines, existing airports, and community planning commissions and governing bodies shall be directed toward avoiding any increase in incompatible land uses based upon current and projected airport activity. It should be recognized that in certain cases an individual increase may be in the total regional interest.

3. For noise abatement purposes, the Bay should be used where airspace requirements permit.

4. Flight operations from military airports with joint-use or military airports transferred to civilian ownership shall meet the planning criteria for civilian airports.

5. The criteria used to govern civilian airport planning will be stated to the military with the clear expectation that parallel actions will take place.

6. New airport site acquisitions shall include control of adjacent land uses to achieve the projected NEF noise exposure level criteria so that acceptable community relationships will be assured.

7. In air traffic control routings of aircraft into and out of the Bay Area, consideration shall be given to minimizing the exposure of residential areas to overflight noise.

8. The Association of Bay Area Governments by all actions available to it:

   a. clearly supports the FAA noise certification requirements for new aircraft and supports a corresponding FAA responsibility for payment of damages resulting from aircraft noise litigation.
   b. opposes any waiver of these noise certification requirements for special classes of aircraft.
   c. requests that the FAA proceed with all possible speed with an engine/nacelle retrofit or replacement program to bring pre-noise certification aircraft into compliance to reduce aircraft noise at its source - the jet engine.
   d. makes it clear to the aviation industry that the capability of airport facilities within the Region to meet future demand will be constrained by the industry's ability to meet these noise criteria.
   e. supports the CARD report objective of a 10 PNdB reduction per decade.

NOISE COMPATABILITY INTERPRETATION

GENERALIZED LAND USE	NEF RANGE	GENERAL LAND USE RECOMMENDATION
Residential and Educational	less than 30	Satisfactory, with little noise impact and requiring no special noise insulation requirements for new construction.
	30 to 35	New construction or development should be undertaken only after an analysis of noise reduction requirements is made and needed noise insulation features included in the design.
	greater than 35	New construction or development should not be undertaken.
Commercial	less than 35	Satisfactory, with little noise impact and requiring no special noise insulation requirements for new construction.
	35 to 45	New construction or development should be undertaken only after an analysis of noise reduction requirements is made and needed noise insulation features included in the design.
	greater than 45	New construction or development should not be undertaken unless related to airport activities or services. Conventional construction will generally be inadequate and special noise insulation features should be included in construction.
Industrial	less than 40	Satisfactory, with little noise impact and requiring no special noise insulation requirements for new construction.
	40 to 50	New construction or development should be undertaken only after an analysis of noise reduction requirements is made and needed noise insulation features included in the design.
	greater than 50	New construction or development should not be undertaken unless related to airport activities or services. Conventional construction will generally be inadequate and special noise insulation features should be included in construction.
Open	less than 40	Satisfactory, with little noise impact and requiring no special noise insulation requirements for new construction.
	greater than 40	Land uses involving concentrations of people (spectator sports and some recreational facilities) or of animals (livestock farming and animal breeding) should generally be avoided.

AIR QUALITY DECISION CRITERIA

Adopted April 7, 1972

1. No new major airport with airline jet operations shall be recommended for a geographic area which has a pollution potential rating of V, as described in the Bay Area Air Pollution Control District report to the Committee (see page III-46).

2. In the selection of airport alternatives, the Committee shall seek those alternatives which minimize air emissions from aviation sources, as well as those from vehicular traffic serving the airports.

3. No new or existing airport shall, as a single emission source, irrespective of other sources, cause state or federal air quality standards to be exceeded in residential areas downwind of the airport.

4. In geographic areas having a BAAPCD pollution potential rating of IV or above, no existing or new airport shall contribute to that area any of the individual air contaminants to an extent greater than the proportion of aviation's contribution in the total Bay Area.

ADDITIONAL COMMITTEE ACTIONS

The following actions were formally adopted by the Study Committee, but not incorporated into decision criteria:

V/STOL: The possibility of future V/STOL facilities and uses in the Bay Area should be acknowledged, but specific recommendations cannot be made at this time because of the uncertainties of its actual production and use.

Corridor Transit: It is assumed that rapid transit along the California Corridor (San Francisco Bay Area to Los Angeles Area) will not be in use as a competitive mode of transportation before 1985.

Southern Crossing: It is possible that the Southern Crossing will not be built by 1985. If it is not, this will have little effect on passengers' choice of airports. It would, however, necessitate additional access to Oakland Airport for East Bay residents.

General Aviation: The general aviation allocations as shown in the April 26 paper to the Committee (see Appendix) are adopted as part of the final aviation plan.

Forum: The Committee will function after June 30, 1972 as a coordinating body for communication between the airports, airlines, communities, and regulatory agencies. This will allow the Committee to discuss further the composition of a continuing forum to serve this function, and will provide some experience in its working.

V-Citizen Response and Public Information

CHAPTER V

CITIZEN RESPONSE AND PUBLIC INFORMATION

A substantial portion of the Study was devoted to public input. In addition to open discussion and wide distribution of reports, response from the public has been received in over 600 pages of testimony from approximately 100 speakers at 5 public hearings, in 950 letters, and in 850 newspaper questionnaires returned.

The public hearings were located to be as accessible as possible to the population centers of the Bay Region and also to reflect some of the locations of the airport alternatives which the Committee was considering. Hearings were held at Fairfield, Oakland, San Jose, San Francisco, and San Rafael.

Approximately 100 people testified: 20% represented environmental and citizen action groups, 20% represented chambers of commerce and community development associations, 20% were individuals, 20% represented city and county governments, and the other 20% represented labor groups, the League of Women Voters, private and aviation-related companies, the State Department of Aeronautics and the Public Utilities Commission, the Federal Aviation Administration, the President's Aviation Advisory Commission, the U.S. Air Force, and the Canadian Consulate.

While the letters received by the Committee were primarily in response to a newsletter article, there was also a wide variety of personal letters from many different citizens expressing their opinions.

The original Aviation Future edition of the newspaper contained a general questionnaire that was useful to the Committee.

PUBLIC HEARINGS

The purpose of these hearings was to receive from agencies and the public response to the technical material prepared to date, to allow additional information to be added to the record, and to receive an insight into opinions and concerns about present and future aviation development in the Region.

The Regional Airport Systems Study Committee had originally scheduled three public hearings in the Bay Area- North, Central, and South Bay. In response to requests from San Francisco and Marin counties, two additional hearings were added. The following is a summary of these hearings:

Fairfield - November 15, 1971

Speakers included local city and county officials, and representatives from an airport, an airport land use commission, a public works department, an industrial development agency. Travis Air Force Base and the State Department of Aeronautics. Approximately eighty people attended.

Most speakers favored development of northern Bay airports as part of a regional airport system because of land available and favorable location for handling growth. For Solano County, it was suggested that there would be a tolerance of airports because of the community's acceptance of Travis. A Travis/Meridian Airport was advocated, with civilian operations on a runway parallel to the existing runway and use of Travis' air traffic control tower. A representative of the Base Commander at Travis stated that although limited civilian use had begun, plans were that military use would not be phased out. Testimony also indicated opposition to any joint use that would interfere with the military mission.

Other suggestions to the RASSC were to consider general aviation needs and air freight and to hold an additional hearing at the recommendation stage of the study. No adverse environmental comments were received at this particular hearing.

Oakland - December 13, 1971

At this hearing, speakers included the Mayor of Oakland, a judge, and representatives from the California Public Utilities Commission, the President's Aviation Advisory Commission, California Department of Aeronautics, Port of Oakland, chambers of commerce/convention and tourism bureaus, citizens, industry groups, labor, League of Women Voters, conservation groups, an economic development agency, and a flower shipping co. (approx. 100 attendees)

Many who testified advocated expansion of Oakland airport (and the corollary of using all airport to capacity), because such development would increase jobs, attract visitors, and improve service.

Others felt that demand should not automatically be met, that growth should be restrained because of detrimental impact on environment, inflated population forecasts, and alternatives to growth, including increasing load factors, and improving ground transit and access.

A member of the President's Aviation Advisory Commission suggested that the RASSC consider the long range needs of the aerospace transportation system, based on user demand, environmental impact, and economic impact on the non-flying public.

The Chairman of the California Public Utilities Commission recommended that use of the existing airports to capacity be encouraged (particularly San Jose and Oakland, and dispersal of services near the origin/destination of passengers. The Civil Aeronautics Board should then consider the Study findings for allocating routes. He offered Commission interest and support in the evolution of the plan.

Recommendations from those who testified included; keep military bases separate, explore the use of STOL, have flight operations over water to reduce noise, include general aviation in the study, look at a total transportation system, hold another hearing before final recommendation, and provide for airport planning and implementation of study findings after the Study is completed. There was negative response to filling the Bay, and to three proposed sites - Richmond, Site E near Alviso, and Buchanan Field, Concord.

<u>San Jose - January 10, 1972</u>

Nearly three hundred people attended, with representatives giving testimony from Congressman Edwards, local mayors, city managers, and councilman, the Sierra Club, Save Our Valley Action Committee, chambers of commerce, League of Women Voters, a school district, airport committees, and industry, citizen, and conservation groups. Many individuals also spoke.

The opinion reiterated almost unanimously was opposition to Site E (Alviso-Fremont area), because of noise and air quality hazards, encroachment on the proposed National Wildlife Refuge Area and growth implications. Many speakers supported no further expansion of San Jose airport, while others recommended such expansion.

Several people again advised the Committee to integrate air travel with other modes of transportation; to revise population forecasts downward, to coordinate with the Metropolitan Transportation Commission; to hold another hearing after the recommendation was made; to consider a regional airport away from urban areas, and to continue the study through an implementaton phase.

There was great concern expressed over some implications of air travel/airport development. It was felt that the needs of the air traveler should not take precedence over those of the rest of the population; that air travel demand was perhaps not as high a priority as other needs (e.g. housing); that there were serious medical effects due to noise and air pollution, and that citizens should exercise some control over the usage of airports. A question for the Committee to consider was who should control the number of flights - CAB, the airlines, the airport, or the passengers?

San Francisco - February 3, 1972

Speakers at this hearing represented the S.F. Airports Commission, Sierra Club, City of Alameda, League of Women Voters, S.F. Chamber of Commerce/Visitors and Convention Bureau, a community development corps, conservation groups, labor, Federal Aviation Administration, Air Transport Association, Bay Conservation and Development Commission, and San Francisco Planning and Urban Renewal Association. Approximately 200 people attended.

Opinion seemed to be divided among those speakers who favored expansion of all area airports (because of increased employment) to accommodate demand, and those who did not favor expansion, but instead higher load factors, fewer scheduled flights, revised forecasts, and dispersal of airports.

Recommendations were made to consider joint use of Hamilton, general aviation needs, long term regional airport planning, distant new airport locations, converting military bases to recreation areas, coordination with MTC, and airports located near the origin and destination of passengers. Again the point was made to consider the majority of the public who do not fly.

Airport expansion involving Bay fill was opposed during testimony. The guideline stated by BCDC, the agency issuing permits for fill, is that if Bay fill is requested for airport expansion, the burden of proof is on the proponent.

San Rafael - February 18, 1972

Speakers were from San Benito, Marin, and Sonoma Counties, representing the Board of Supervisors of San Benito County, City of Hollister, Hollister Chamber of Commerce and Women's Club, City of Novato, Novato Planning Commission, Novato Neighborhood Planning Groups, two homeowners associations, Marin Alternative, and Sonoma County Airport.

Testimony from the Hollister area stated opposition to a regional airport in their community, because of the expansion it would bring to their rural area, severe air pollution potential, and earthquake hazards. Alternatives suggested were dispersal of services to small airports, and use of rapid transit.

Also considered was the joint civilian/military use of Hamilton Air Force Base. Most speakers opposed such use of Hamilton because it would seriously effect the noise and air pollution levels, property values, and rural nature of Marin County.

The Study Committee was requested to hold other public hearings prior to final adoption of a plan.

Many Marin citizens were concerned that impact of airports on their neighborhoods should be thoroughly evaluated before any recommendations were made. An example of the community viewpoint was expressed by the representative of Marin Alternative: "Thank you, gentlemen for your professional views and studies. But in the final analysis it is we who want to determine the make up of our communities and our regions."

LETTERS TO THE REGIONAL AIRPORT SYSTEMS STUDY COMMITTEE

Over nine hundred and fifty letters were received from individuals and organizations, commenting on the study.

The most frequent comment (825) was to state opposition to airport expansion or development involving Bay fill. Many also opposed Bay fill for <u>any</u> purposes, pointing out the necessity for Bay preservation. Save San Francisco Bay Association sent notices to its membership requesting that opinions be sent in to RASSC; most of the 825 letters came as a result of that request.

Response was also great to the preliminary alternative mentioning a new airport in the San Jose/Fremont/Alviso area (site E). Letters and petitions were received from 122 people who opposed an airport in this location.

Others wrote with various comments, including:

- favored a regional airport away from populated areas, particularly possible use of Travis AFB
- favored a better use of existing airports through improved access, flight schedules, and load factors
- favored civilian use of nearby military bases
- suggested using alternate means of transportation
- opposed any airport expansion/development
- pointed out the small percentage of the population who are airplane passengers
- commented that they would be willing to choose reduced service, for environmental reasons

Excerpts from several letters are reproduced here to demonstrate the range of interest.

EXCERPTS FROM LETTERS TO THE REGIONAL AIRPORT SYSTEMS STUDY COMMITTEE

"...We don't need a bigger airport! ... You would be killing off wildlife. I think you should take in consideration that the kids now will have to suffer with the airport later. How would you like it if you had to hear jets fly over your house? Think of the kids to come. This world will be one big pollution dump!... Or listen to this! No more animals, think of that. If there are no more trees, than we couldn't breathe. All the person who is selling the land is interested in is money. Please for our sake, think intelligent! Don't you care?..." Terri Trettin, Fremont

"...The existing airports are presently not used to their capacity: although there are many flights, a large number of them run with only a small number of passengers. The flying public must be willing to subjugate their convenience in choosing among many duplicated and half-filled flights to the more important public interest of preserving our environment from unnecessary development..." Richard Lee, Berkeley

"...I am unqualifiedly and unalterably opposed to filling any of the Bay for airport expansion or any other reason. I fly considerably. However, I will forego flying and go back to trains or buses, or curtailment of trips, rather than fill another square foot of the Bay. America must not destroy itself in the name of progress..." Virgil Bozarth, Martinez

"...In considering alternative plans for the expansion of airport facilities my family urges NO PLAN THAT INVOLVES BAY FILL..." Anita Pitcher, Burlingame

"...Being an air traveler of more than one million miles under my belt, I most heartily concur with any yes votes for expanding airport facilities in and around the Hamilton Field area..." Charles Guilder, San Francisco

"...I do not believe that any more of San Francisco Bay should be filled, least of all for airport sites. San Francisco Bay is unique. It is open space that remains ecologically for the well-being of all living creatures including ourselves and the generations to come. It was not put here as an expendable piece of real estate for future commercially calculated gains..."
Telda Ralko, Richmond

"...We do not want jets taking off over Fremont..." Frank and Anna Broughton,
Frank and Anna Broughton, Fremont

"...We are very much against the proposed San Jose-Alviso jetport, and do not want jets taking off over our homes and schools in Newark..."
Mr. and Mrs. Gettman, Newark

"...We urge you to seriously consider all the adverse conditions that will result by expanding our present airports or building new airports in the Bay Area. More smog, more noise and more people we do not need and you gentlemen surely must be aware of this by now..." Mr. and Mrs. Frank Yakushi, San Mateo

QUESTIONNAIRE RESULTS

Aviation Future, a newspaper describing the Regional Airport Systems Study, was published in November 1971. During the winter of 1971, 30,000 copies were distributed to:

individuals	43%
conservation/ecology groups	9%
League of Women Voters	9%
chambers of commerce	8%
Bay Area airports (13 airports)	13%
ABAG mailing lists	10%
others	8%

Another edition of Aviation Future is being published and distributed in June 1972. 30,000 copies will again be distributed. This edition summarizes the recommended aviation plan.

Eight hundred and fifty-one people answered and returned the questionnaire contained in the newspaper, and also reprinted by Save Our Valley Action Committee, Novato Planning Committee, the Fremont Argus, and the Novato Advance.

A summary of the responses follows.

It should be noted that the county of residence of the respondents did not provide a uniform sample of all communities in the Bay Area. A breakdown of the county of residence of respondents compared to population is:

County	Population (U.S. Census) 1970	& of Total Bay Area Population	# of Responses to Questionnaire	% (by county) of Responses to Questionnaire
Alameda	1,073,000	23	213	25
Contra Costa	558,000	12	122	14
Marin	206,000	4	90	11
Napa	79,000	2	0	0
San Francisco	716,000	16	40	5
San Mateo	556,000	12	39	5
Santa Clara	1,065,000	23	323	38
Solano	170,000	4	8	1
Sonoma	205,000	4	8	1
TOTAL	4,628,000		851	

Wanted: Your Opinion

Your opinion can have influence even if you do not testify at the public hearings. Please help us reach the "best" recommendation for the Region by mailing us your completed questionnaire as soon as possible. Your written responses, in addition to answers to the following questions, are welcome.

UNUSABLE

1. In your opinion, should the Bay Area provide additional facilities in the future for air travel into and out of the Region?

27 — 305 (35%) Yes — 275 (22%) No — 244 (29%) I need to know more about the alternatives

2. What relative importance do you assign to the following (please rank from 1, most important to 5, least important).

   ____ Air travel availability and quality
   ____ Easy access to and from airports
   ____ Financial benefits of airports (see below)
   ____ Financial costs of airports
   ____ Environmental effects of aviation

3. Would you vote for an airport development:
   If the development were in your part of the Region?

11 — 242 (28%) Yes — 465 (55%) No — 133 (16%) Undecided

   If the development were in some other part of the Region?

38 — 236 (28%) Yes — 288 (34%) No — 289 (34%) Undecided

4. As an airline passenger, how long a trip (in minutes) would be "reasonable" for you to travel to or from the airport?

48 — 18 (2%) 10 — 129 (15%) 20 — 343 (40%) 30 — 170 (20%) 40 — 143 (17%) 50 or more

5. If flight schedules were the *same* at these airports, which airport would you choose?

from home		from work	from home		from work
(17%) 147	San Francisco	130 (15%)	(38%) 319	San Jose	250 (29%)
(35%) 295	Oakland	273 (32%)	(2%) 16 (*where*)	other	21 (2%) (*where*)

73-home
178-work

6. If access time and cost were about the same for automobiles and rapid transit, which would you choose?

15 — 143 (17%) automobile — 652 (77%) rapid transit — 41 (5%) undecided

7. In what city do you live? ~~(see below)~~
   In what city do you work? "

8. How many airline flights have you taken *out* of the Bay Area in the last year?

14 — 190 (22%) 0 — 265 (31%) 1–2 — 165 (19%) 3–4 — 217 (26%) 5 or more

9. Of the environmental issues listed below, how would you rank them in order of importance to you (from 1 most important to 6 least important)? (see below)

   ____ air quality ____ plant life
   ____ bay preservation ____ population level
   ____ noise ____ wild animal life

10. Please return to: Regional Airport Systems Study, Association of Bay Area Governments, Hotel Claremont, Berkeley, California 94705

QUESTION 2

2. What relative importance do you assign to the following (please rank from 1, most important to 5, least important).

	1	2	3	4	5	Unusable
____ Air travel availability and quality	191	216	174	129	89	52
____ Easy access to and from airports	119	214	215	152	100	51
____ Financial benefits of airports	22	63	168	201	333	64
____ Financial costs of airports	37	201	117	246	187	63
____ Environmental effects of aviation	486	97	113	48	74	33

QUESTION 5 - If flight schedules were the same at these airports, which airport would you choose?

Airport Preference from Home (# of responses)	Airport	Airport Preference from Work (# of responses)
295	Oakland	273
147	San Francisco	130
319	San Jose	250
5	Marin County	5
1	San Rafael	1
2	Contra Costa	1
1	Buchanan	1
2	Solano County	2
2	San Benito County	2
1	Mendocino County	-
1	Napa	1
1	Palo Alto	1
-	Fremont	1
-	Livermore	2
-	Walnut Creek	2
-	Hamilton	2
73	Unusable	178

QUESTION 9 - Of the environmental issues listed below, how would you rank them in order of importance to you (from 1-most important to 6-least important)?

	1	2	3	4	5	6	7	Unusable
air quality	413	215	96	46	34	22	0	25
Bay preservation	105	172	195	187	92	68	2	30
noise	163	182	164	97	89	136	0	20
plant life	54	49	120	194	254	148	0	32
population level	230	122	132	119	81	139	0	28
wild animal life	56	64	85	139	219	254	0	34
other	1	1	0	0	0	0	1	0

There are 157 additional comments, falling into the following categories: airport development (46), environment (43), access (22), other modes of transportation (10), questionnaire itself (8), RASS itself (6), improved airline service (5), personal relationship to aviation (7), and multiple comments (9).

Comments and Comparisons

1. Questions 1 and 8 - providing additional facilities and number of flights in last year; Of the respondees who had flown one or more times out of the area, more favored additional facilities than did not. However, those who had not flown at all disapproved of additional facilities more often than they approved.

2. Questions 3 and 8 - voting for nearby or distant airport development and number of flights; Most people responded that they did not favor either nearby or distant development, regardless of number of flights.

3. Questions 4 and 6 - reasonable travel time and preference between automobile and rapid transit; the travel time chosen most often as reasonable by those who preferred either the automobile or rapid transit was 30 minutes.

The travel times were ranked as follows:

- automobile ... 30 minutes first, then 20, 40, 50, and 10 minutes
- rapid transit ... 30 minutes first, then 40, 50, 20, and 10 minutes

Questions 4 and 8 - reasonable travel time and frequency of flight; Whatever the frequency of flight, the preferred travel time was 30 minutes.

4. Questions 1 and 3 - provide additional facilities and nearby/distant airport development; Of the responses possible, more responded no to providing facilities and no to voting for development-either nearby or distant.

Desire for facilities and willingness to vote for airport development are correlated-the most frequent response was no facilities/no development; the next most frequent response was yes facilities/yes development.

5. Questions 1 and 7a - providing facilities and county of residence; Of responses from Alameda, San Mateo, Santa Clara, and Sonoma Counties. more responded no to additional facilities than responded yes. The reverse was true for Contra Costa, Marin, San Francisco, and Solano County respondees-more responded yes to additional facilities.

6. Questions 5 and 8 - airport choices from home and work and number of flights; (OAK=Oakland; SFO=San Francisco; SJC=San Jose)

<u>From home</u>;

Those who have flown 3-4, or more than 5 times/chose OAK, then SJC, then SFO
Those who have flown 0 or 1-2 times/chose OAK, then SJC, then SFO

<u>From work</u>;

Those who have flown 0, 1-2, or 3-4 times/chose OAK, then SJC, then SFO
Those who have flown more than 5 times/chose SJC, then OAK, then SFO

7. Questions 5 and 7 - home and work airport choice, and county of residence and employment; Airport choices from home and work when compared with county of residence and employment were so similar that they followed this pattern with only minor discrepancies;

County	Airport Choice (listed in order of ranking)
Alameda	OAK, SJC, SFO
Contra Costa	OAK, SFO, SJC
Marin	SFO, OAK
Napa	no response to questionnaire
San Francisco	SFO, OAK, SJC
San Mateo	SFO, SJC, OAK
Santa Clara	SJC, SFO, OAK
Solano	OAK, SFO
Sonoma	OAK, SFO

8. Questions 6 and 8 -choice of automobile and rapid transit and frequency of flights; Of the people who chose rapid transit, greatest number of responses come from those who had flown 1-2 times in the past year, while of those who chose automobiles, the greatest number of responses came from those who had flown more than 5 times. However, whatever the flight frequency, more people chose rapid transit than chose the automobile.

9. Questions 7 and 8 - county of residence/employment and frequency of flight; The counties with a large sample - Alameda, Santa Clara, and Contra Costa-all followed this pattern of flight frequency; 1-2 flights/year most frequent, then more than 5, then 0, then 3-4 flights. (This applies to both county of residence and county of employment.)

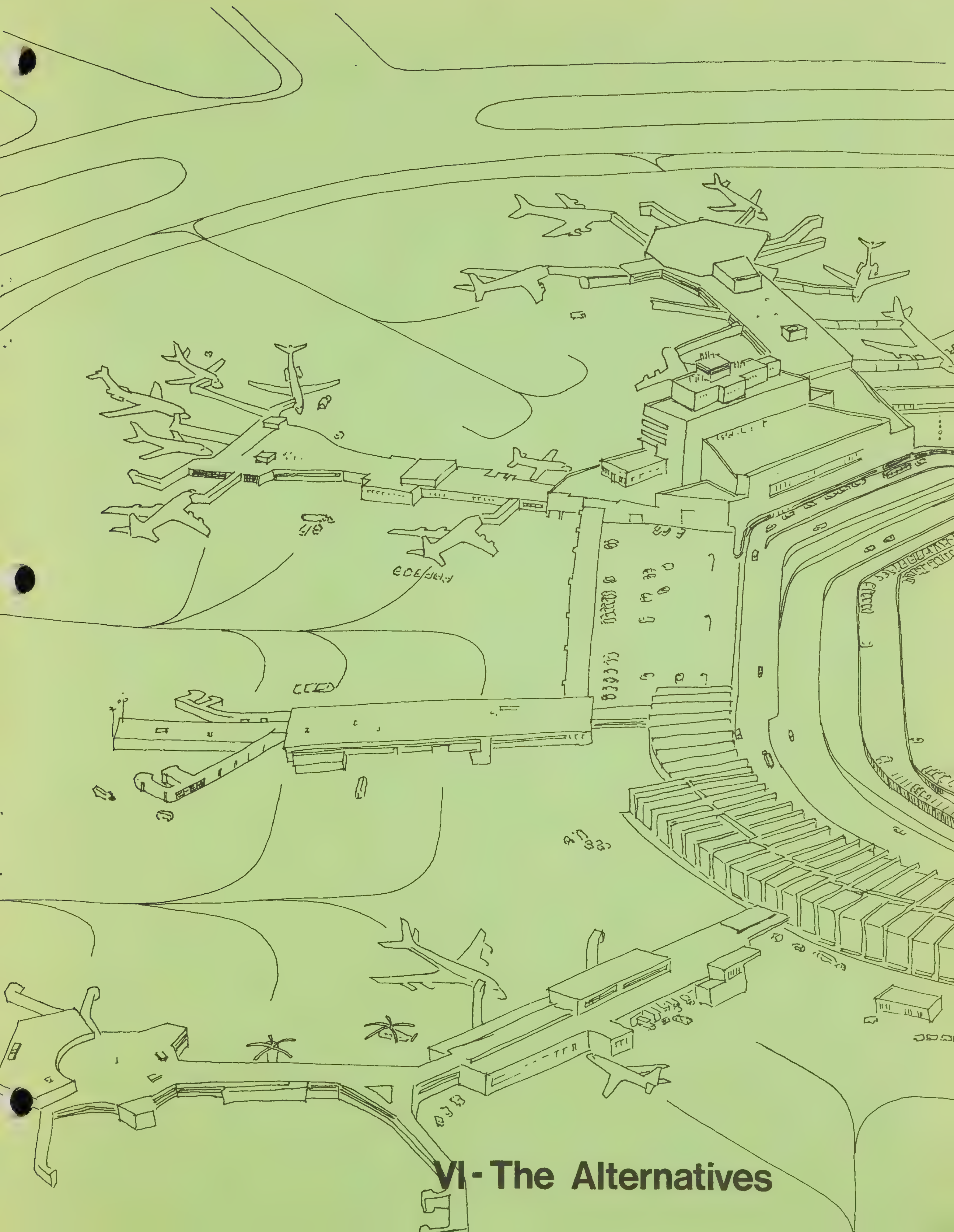
10. Compare the home and work airport choices stated in question 5 with the consultant work on Access done by Wilbur Smith, Phase I, June, 1970: (Airport Access)

    The Access report shows that for 1975, assuming unconstrained conditions, air passengers would be allocated as follows:

SFO	33 %
OAK	44 %
SJC	23 %

    The results of this questionnaire show that, of those who responded (note that there is a low response rate from Napa, San Francisco, San Mateo, Solano, and Sonoma Counties), and with unrestrained conditions, their choice of airports in 1972 would be as follows:

From Home		From Work	
SFO	17%	SFO	15%
OAK	35%	OAK	32%
SJC	38%	SJC	29%



VI - The Alternatives

CHAPTER VI

THE ALTERNATIVES

An Evolutionary Recommendation

The aviation alternative which seemed "best" in the Committee's judgment and which is central to the recommended plan is shown in stages below.*

Recommended Stage Development in Millions of Annual Passengers for 1975, 1980, 1985

Airport	1975	1980	1985	Runway Change
SFO	19	23	31	none
OAK	6	13	24	new runway
SJC	3	6	10	extended runway
TRA	0	1	6	new runway
HAM/NAP	0	1	1	extended runway at Napa only
TOTAL	28	44	72	

Evolution of this alternative occurred through nearly two and one half years of technical studies on likely aviation, economic, and environmental impacts and requirements under various assumptions, five public hearings, input from many government officials, and many revisions of the preliminary alternatives. The intent throughout was to choose the "best" alternative from a wide range of choices developed through an open process.

Preliminary Alternatives

The preliminary alternatives focused the work and stimulated suggestions for improvements. Eleven preliminary alternative combinations of airports and capacities evolved from Committee and staff work late in 1970. These guided the Committee's work for about a year under accompanying assumptions of forecast demand, aircraft type, annual operations, passenger load and delay factors, and runway capacity.

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* The recommendation also includes criteria adopted by the Committee on forecasts, air quality, noise, access, and capacity. The recommendations for SFO, OAK, and SJC are conditional on certain criteria. For instance, to comply with State noise standards at high traffic volumes, there would need to be retrofit or retirement of certain engine types. Seat occupancy factors would also need to rise from present levels. Failure to meet certain criteria at close-in airports might result in a shift of more service to Travis than allocated. This in turn would depend on what happens to Sacramento Airport if traffic at Travis reaches high levels.

The passenger demand forecast is especially important and difficult. The forecasted 1985 demand of 83.5 million annual passengers initially assumed would have been met by any of the eleven preliminary alternatives except the last. The last assumed full capacity on existing runway configurations at OAK, SJC, and SFO and fell short of forecasted demand by some 29.5 million passengers.

After the eleven preliminaries, several alternatives were suggested:

- A regional mid-Bay airport with BART connections to replace SFO and OAK with two sets of parallel 12,000 foot runways over 2,000 acres of fill. It is intended to relieve noise impact, retain accessibility, and replace separate SFO and OAK fills. SFO and OAK would be used for parking and terminal functions.

- A regional airport in eastern Contra Costa County.

- Marin with more open options:

  a) A major airport parallel to Lakeview Road where it intersects Highway 37 east of the Petaluma River

  b) Shifting Hamilton AFB as a reliever airport at 2.7 million passenger capacity to a major facility, with SJC at 16.5 million passengers.

<u>Revised Alternatives</u>

Following the public response, the Committee removed these airports from active consideration:

Hollister	Richmond
Site E	Concord (for jet airline operations)
North Bay	Livermore (for jet airline operations)
Mid-Bay	Lakeview Road

Based upon the Committee's discussions and actions, revisions #1 and #2 were prepared by staff. Committee actions on these revisions further adjusted the alternatives as follows:

- Removed any SFO alternatives above the present design capacity of approximately 30 million annual passengers

- Added a widely spaced (5000 feet) parallel runway 11-29 at OAK

- Restricted SJC to about 117,000 airline operations (about 8 million annual passengers), based on environmental constraints

- Introduced a California Corridor service point in the North Bay area.

- Introduced the possibility of some parallel operation of SJC and NAS Moffett Field (with joint civilian use of Moffett)

- Removed Napa from any consideration as a regional airport and limited it in size to 1-2 million annual passengers

At this time, decision criteria being adopted by the Committee contained changes in assumptions being used in the decision criteria. Two extemely important changes were the decreased passenger demand forecast and the increased aircraft seat occupancy factor. These lowered the number of aircraft operations and considerably eased the pressure to recommend major and costly new facilities with large impacts on surrounding areas. They also made it easier to plan a staged redistribution of passenger and airport growth from the present level to 1985.

The Selection

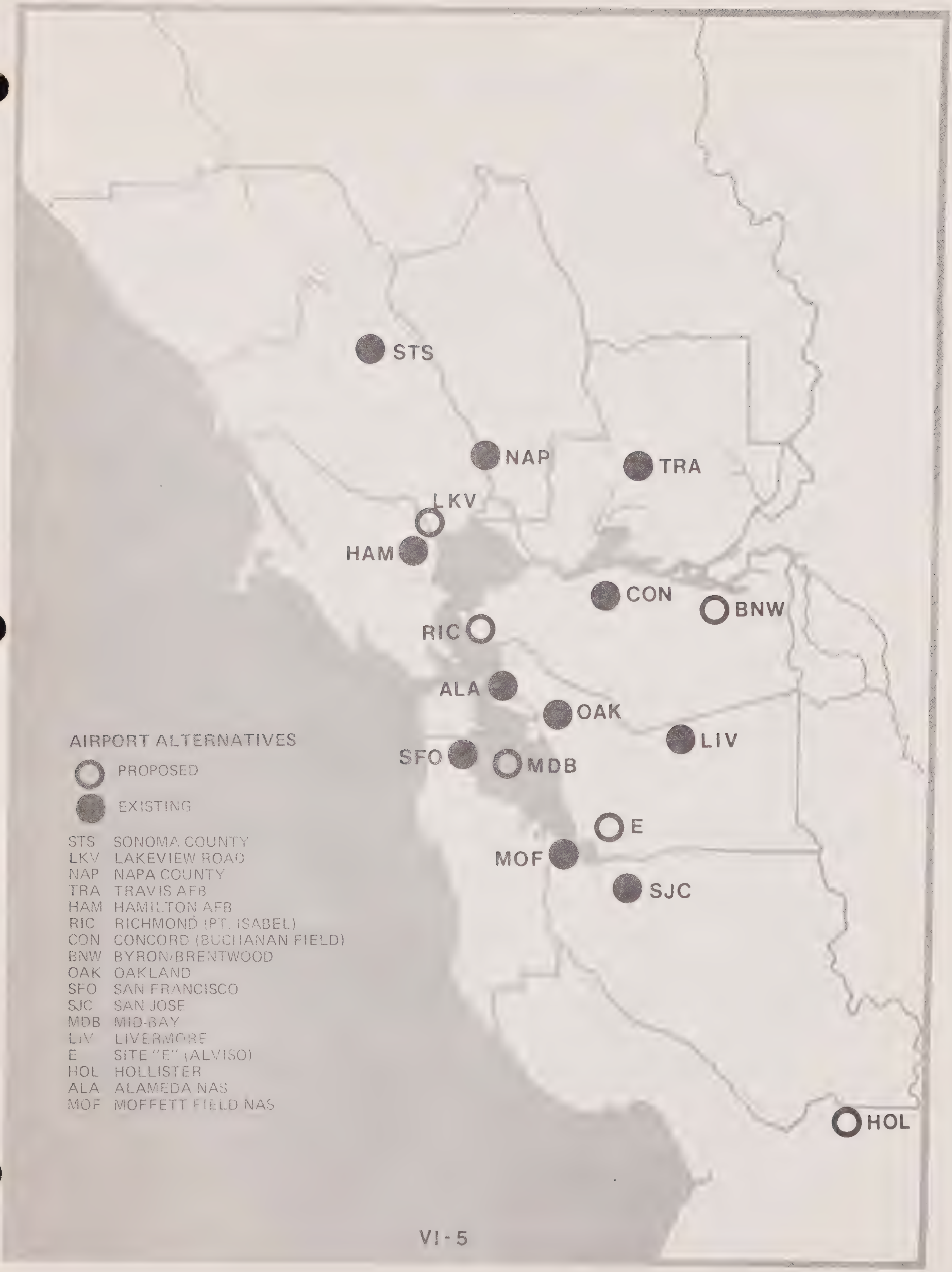
What form the original alternatives would finally take became increasingly clear toward the end of the study. The process was one of elimination and readjustment as assumptions hardened and constraints converged.

SFO management estimated the practical limit of SFO around 31 million passengers annually. SJC management in the midst of high population expectations for the South Bay put a lid on its airport at around ten million passengers for environmental reasons. Much of the demand generated in that area then would have to go to SFO and OAK. Travis presented the problems of the remote site. Most people would not choose to travel to it unless unique service were placed there. Capital costs for access and terminal facilities for a major airport at this site would be large. A Sacramento official also expressed concern over cutting into Sacramento Airport's potential market with a high level of activity at Travis.

Attention then focused on Oakland to satisfy a major share of the 72 million passengers the Committee anticipated in its adopted demand forecast. OAK's accessibility and over-water noise abatement advantages were considered along with its Bay fill drawback.

Napa or Hamilton was slotted to meet the local need of the northern counties for California Corridor service rather than to serve as a major regional airport. Capacity in this role would be for about one million passengers annually at either one or the other, but not both. Local sponsorship or veto would be controlling in the selection.

Failure of OAK or SFO to meet certain criteria also included in the recommendation would either force more service to Travis than allocated or would result in a failure to meet projected demand or a search for another site.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AIRPORT ALTERNATIVES
PROPOSED
EXISTING
STS SONOMA COUNTY
LKV LAKEVIEW ROAD
NAP NAPA COUNTY
TRA TRAVIS AFB
HAM HAMILTON AFB
RIC RICHMOND (PT. ISABEL)
CON CONCORD (BUCHANAN FIELD)
BNW BYRON/BRENTWOOD
OAK OAKLAND
SFO SAN FRANCISCO
SJC SAN JOSE
MDB MID-BAY
LIV LIVERMORE
E SITE "E" (ALVISO)
HOL HOLLISTER
ALA ALAMEDA NAS
MOF MOFFETT FIELD NAS

Preliminary Airport Alternatives
for a 1985 Demand of 83.5 Million Annual Passengers

ALTERNATIVES (Increase in capacity shown by asterisks*)	AIRPORT	ANNUAL AIRLINE PASSENGERS ENPLANED AND DEPLANED (000)	ANNUAL COMMERCIAL AIRCRAFT OPERATIONS
1. OAKGRO	San Francisco Internat'l.	32,650	424,000
(SFO-OAK*-SJC)	Oakland International	34,314	446,000
	San Jose Municipal	16,500	259,000
Total		83,464	1,129,000
Growth in airport capacity only at OAK (OAKGRO)			
2. ALGROE	San Francisco Internat'l.	37,884	492,000
(SFO*-OAK*-SJE*)	Oakland International	24,100	313,000
	San Jose Site "E" (New)	21,480	279,000
Total		83,464	1,084,000
Growth in capacity allocated among named airports including Site E in San Jose. (ALGROE)			
3. HOLRLV	San Francisco Internat'l.	32,650	424,000
(SFO-OAK-HOL*-	Oakland International	13,780	179,000
HAM*-CON*-LIV*)	Hollister (New Airport)	30,774	400,000
	Hamilton Air Force Base	2,678	41,800
	Buchanan Field	2,392	37,400
	Livermore Airport	1,190	18,600
Total		83,464	1,100,800
Establishes a major airport at Hollister with reliever airports at Hamilton, Buchanan, and Livermore sites. Much of growth impact associated with Hollister is out of the region. (HOLRLV)			
4. TRAVIS	San Francisco Internat'l.	32,650	424,000
(SFO-OAK-SJC-	Oakland International	13,780	179,000
TRAV*)	San Jose Municipal	7,500	117,000
	Travis Air Force Base	29,534	384,000
Total		83,464	1,104,000
The presently established system with all growth allocated to TRAVIS. (TRAVIS)			

ALTERNATIVES (Increase in capacity shown by asterisks*)	AIRPORT	ANNUAL AIRLINE PASSENGERS ENPLANED AND DEPLANED (000)	ANNUAL COMMERCIAL AIRCRAFT OPERATIONS
5. SFOKNO (SFO*-OAK*-SJC-SAR*-RICH*)	San Francisco Internat'l.	37,884	492,000
	Oakland International	22,007	286,000
	San Jose Municipal	16,500	259,000
	Sonoma County Airport	2,678	41,800
	Richmond (New Airport)	4,395	68,600
Total		83,464	1,147,400

Growth allocated to SFO and OAK with a northern tilt to expanded service at Santa Rosa and a new airport at Richmond. (SFOKNO)

ALTERNATIVES (Increase in capacity shown by asterisks*)	AIRPORT	ANNUAL AIRLINE PASSENGERS ENPLANED AND DEPLANED (000)	ANNUAL COMMERCIAL AIRCRAFT OPERATIONS
6. SJEMAX (SFO-OAK-SJE*)	San Francisco Internat'l.	32,650	424,000
	Oakland International	17,000	221,000
	San Jose Site "E" (new)	33,814	440,000
Total		83,464	1,085,000

All growth allocated to Site E in San Jose. (SJEMAX)

ALTERNATIVES (Increase in capacity shown by asterisks*)	AIRPORT	ANNUAL AIRLINE PASSENGERS ENPLANED AND DEPLANED (000)	ANNUAL COMMERCIAL AIRCRAFT OPERATIONS
7. SJEMX2 (SFO-OAK-SJE*)	San Francisco Internat'l.	32,650	424,000
	Oakland International	8,814	115,000
	San Jose Site "E" (New)	42,000	546,000
Total		83,464	1,085,000

All growth in capacity provided at Site E at San Jose, with OAK operating at less than present runway capacity. (SJEMX2)

ALTERNATIVES (Increase in capacity shown by asterisks*)	AIRPORT	ANNUAL AIRLINE PASSENGERS ENPLANED AND DEPLANED (000)	ANNUAL COMMERCIAL AIRCRAFT OPERATIONS
8. HOLNAP (SFO-OAK-SJE-NAP*-HOL*)	San Francisco Internat'l.	32,650	424,000
	Oakland International	13,780	179,000
	San Jose Municipal	7,500	117,000
	Napa County Airport	2,689	43,000
	Hollister (New Airport)	26,845	349,000
Total		83,464	1,112,000

Present system with Napa County Airport operating as a reliever airport and a new airport at Hollister. (HOLNAP)

ALTERNATIVES (Increase in capacity shown by asterisks*)	AIRPORT	ANNUAL AIRLINE PASSENGERS ENPLANED AND DEPLANED (000)	ANNUAL COMMERCIAL AIRCRAFT OPERATIONS
9. OAKMAX (SFO-OAK*-SJC)	San Francisco Internat'l.	32,650	424,000
	Oakland International	43,314	563,000
	San Jose Municipal	7,500	117,000
Total		83,464	1,104,000

Growth in airport capacity only at OAK. (OAKMAX)

ALTERNATIVES (Increase in capacity shown by asterisks*)	AIRPORT	ANNUAL AIRLINE PASSENGERS ENPLANED AND DEPLANED (000)	ANNUAL COMMERCIAL AIRCRAFT OPERATIONS
10. NAPOAK (SFO-OAK*-SJC-NAP*)	San Francisco Internat'l	32,650	424,000
	Oakland International	24,100	313,000
	San Jose Municipal	16,500	259,000
	Napa County Airport	10,214	133,000
Total		83,464	1,129,000

Growth at OAK and a greatly expanded facility at Napa, making it a full-service regional airport. (NAPOAK)

ALTERNATIVES	AIRPORT	PASSENGERS (000)	OPERATIONS
11. PREFAC (SFO-OAK-SJC)	San Francisco Internat'l	32,650	424,000
	Oakland International	13,780	179,000
	San Jose Municipal	7,500	117,000
Total		53,930	720,000

No growth of existing capacity of the three named airports; only 65% of the total forecasted passengers for 1985 can be accomodated under this system. (PREFAC)

ALTERNATIVES*

ASSUMPTIONS/ISSUES PAPER

INTRODUCTION

The turning point of the airport study is the complicated and controversial process of recommending what is the "best" aviation alternative in the context of a wide range of regional concerns. Here, the Committee considers the aviation, economic, and environmental needs of the Region, together with public response, technical findings and its own developing sense of the regional public interest. Afterward, the Committee's chosen alternative can be translated and adopted in the Association's Regional Plan and grant review procedures.

As the issues evolve, the Committee will develop decision criteria and agree on a range of alternatives. Both the criteria and the alternatives are open to improvement until a final choice is made.

Early in the process, some alternatives may be dropped or changed where their penalties appear unacceptable. New alternatives may enter for evaluation. Final contenders can be closely examined to see where one surpasses the others, for whom, and to what extent. Attention can then focus on those criteria which prove controlling for combinations of airports and capacities which work best for the Region, in the Committee's judgment.

APPROACH - EVOLUTION OF PRELIMINARY ALTERNATIVES

Seeing what the full range of choices is or what it might be is difficult - nearly as difficult as deciding what criteria they will be judged by. To widen its choices, the Committee did not limit its range to extremes such as "If we had it to do all over again, where would airports be sited and traffic allocated?" or "Keeping only what we have, how can we make the best of it?" Instead, the Committee took eleven combinations of airports from twelve airport sites, realizing that all the possible combinations of airports would result in more alternatives than it could reasonably evaluate. So far there are only six airports that vary in capacity within these combinations to yield the eleven alternatives - four existing and two new airports. The Committee assumed a 1985 annual demand forecast of 83.5 million in all cases except one. Variations in 1985 annual passenger capacity among the existing major airports appear in the following chart.

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* Prepared for the Regional Airport Systems Study Committee February 25, 1972

1985 PASSENGER CAPACITY RANGE FOR EXISTING MAJOR AIRPORTS

(in millions)

	SAN FRANCISCO	OAKLAND	SAN JOSE
Lowest	32.7	8.8	0
Highest	37.8	43.3	42.0

TOTAL PRESENT INVESTMENT (in millions of dollars)

	SAN FRANCISCO	OAKLAND	SAN JOSE
Public	251.4	45.5	3.9
Private	842.1	1.5	1.1
Total	1,093.5	47.0	5.0

San Francisco Airport is never less than 32.7 million* and Hollister is substituted for San Jose Municipal Airport in Alternative Three.

The methodologies used for analyzing the preliminary eleven alternatives in various dimensions can generally be applied to additional alternatives. This will be done for the additional sites suggested during the hearings. If the Committee desires greater detail, some additional contract work may be necessary.

The content of the preliminary alternatives reflects both existing proposals for various airports as well as specific requests. For example, Travis Air Force Base as a joint civil-military airport appeared in ABAG's Preliminary Regional Plan; Hollister, an alternative to San Jose Municipal, came from comments of a San Jose organization, Save Our Valley Action Committee; Hamilton Air Force Base appeared at the request of Marin County; and Richmond appeared in response to a request for STOL. In formulating airport combinations, the following were used: passenger load factors, runway capacity, aircraft type, annual operations, and delay factor.

Alternative #11 takes existing runway configurations at Oakland, San Jose, and San Francisco up to capacity under assumed load, aircraft mix, and delay factors. Uniquely, it is short (by 35%) of meeting the forecast 1985 passenger demand.

The other ten alternatives assume that the 83.5 million passengers forecast for 1985 will be accommodated. For some airports within an alternative, present runway configurations are taken as given. Passenger volume is then derived assuming an annual aircraft operations capacity for the runway system and an average passenger load factor for the aircraft type assumed.

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* The reason for this is that the construction program currently underway and scheduled for completion in 1976 will provide that capacity.

In other instances the number of passengers is given and operations are calculated. When the capacities for several airports are found within an alternative, the remaining balance is subtracted from 83.5 million passengers and allocated to a remaining airport. The number of aircraft operations to meet this residual demand is then calculated at an assumed load factor. A runway system is set to match this number of operations. In the case of the reliever airports, the market served was assumed to be the California Corridor between Los Angeles and the San Francisco Bay Area.

ISSUES

For each alternative, assumptions interlock on annual passenger demand, load factors, and annual aircraft operations for 1985. These are basic to forming the alternatives.

1. Ten alternatives assume an annual passenger demand of 83.5 million for 1985. Is this reasonable? What population, employment, and income levels will hold in 1985? How sensitive is demand to each of these levels? What effect would changes in fares and preferences to fly have? <u>How many passengers should be anticipated?</u>

   Assumed are average aircraft load factors for 1985. They average 55%. This average and the passenger demand translate into the number of annual operations for assumed aircraft types. <u>Are operations based on a 55% load factor reasonable to accommodate when they compete with other public concerns for scarce public resources and result in some negative impacts?</u> What is a reasonable balance between load factors and flight schedules? <u>How many aircraft operations should be anticipated?</u> Is the present system adequate for this and for how long?

2. Ten preliminary alternatives are based on a demand of 83.5 million and one is based on existing capacity of 54 million without expansion. Should there be some range of choice inbetween these? <u>Can the "best" choice come from the range of allocations in the preliminary alternatives?</u> Could improved load factors and distribution of flights increase the capability of existing airports above 54 million passengers?

3. Can the preliminary alternatives be adjusted to include a better range of choices of airport sites or are the listed ones good enough? If the best choice can't be made from the preliminaries, what should be done?

4. Several alternatives were suggested after the 11 preliminaries came out. <u>How should these be accommodated?</u>

   - A regional mid-Bay airport with BART connections should replace SFO and OAK. This new airport would have two sets of parallel 12,000 foot runways over 2,000 acres of fill. It is intended to relieve noise impact, retain accessibility and replace separate SFO and OAK fills. SFO and OAK would be used for parking and terminal functions.

- A regional airport in eastern Contra Costa County.

- Marin with more open options:

  a) A major airport parallel to Lakeview Road where it intersects Highway 37 east of the Petaluma River
  b) Shifting Hamilton as a reliever airport at 2.7 million passenger capacity to a specified non-Hollister alternative, where SJC is at 16.5 million

5. Assuming a high degree of unknowns, uncertainties, and contingencies, how can an alternative be made that is firm enough to be a guide but flexible enough to stand the test of time and contingencies? Can decision criteria be drafted to trigger on certain indicators of change for staged growth (such as reaching a pre-set load factor in a pre-set percentage of the total market over a given time period)?

6. What is the potential role of each airport in the regional scheme? What is the potential role of each military airport should it become surplus or otherwise available for civil use?

7. How will preliminary or subsequently investigated alternatives compare from a regional standpoint over criteria developed from these aspects:

   - airspace
   - airport capacity
   - demand
   - access
   - noise
   - air pollution
   - Bay fill
   - other environmental aspects and land use
   - capital cost
   - economic benefit

8. Are there any penalties which would eliminate an alternative from the outset (i.e., some capital cost or noise or fill criteria)?

9. From a regional standpoint, if the degree of difference among the alternatives in a particular dimension is slight, should that dimension be dropped? For example, there is a 2% difference in regional household income at stake in the choice of preliminary alternatives according to the economic study. Is this then a significant enough area in which to compare the alternatives?

10. Which dimensions take priority over which others in case of conflict? Criteria can be interrelated so that some take precedence over others in case of conflict.

11. What does the choice of alternatives assume for or require of airlines, airport operators, regulatory agencies, communities affected, and the flying public? Does this affect the viability of your first, second, or third choice?

Any alternative creating remote capacity requires regulatory agency support or else another National-Dulles situation will result.

No alternative creating additional capacity at a given airport can survive the veto of its owner. For example, creating a capacity of 16.5 million annual passengers at San Jose while the San Jose City Council has other ideas affects the other airports in the system. On the other hand, a local airport owner may want to expand beyond the capacity provided in the alternative chosen. To the extent this would not conflict with the priorities and provisions of the alternative chosen, this should not affect a regional airport plan. How much latitude should there be?

How much could San Francisco Airport be expected to sacrifice for the Region if the public interest of the two were found to differ? SFO is already committed to substantial revenue bond financing based on a very high level of traffic, and ultimately backed by the San Francisco taxpayer. What could be done about it in the way of a viable alternative if San Francisco's interests differed from the regional interest?

12. If coordinated interactions among airports, communities, federal agencies and the airlines are found to be essential to the plan, how are these interactions assured?

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The Regional Airport development pattern - dispersed or concentrated, expanded existing airports or newly created ones - should be the outcome of balancing public needs as specified in the decision criteria to come.

AN ANALYSIS OF ADDITIONAL AIRPORT SITES*

INTRODUCTION

Three different possible sites for major regional airports were suggested at the public hearings:

- North Bay, near Lakeville Road in southern Sonoma County
- Mid-Bay, north of the San Mateo Bridge
- Eastern Contra Costa County, in the Byron/Brentwood area

In addition, during the San Jose hearing, mention was made of utilizing the San Joaquin Valley as a possible site. Staff comment on this suggestion has been withheld pending direction from the Committee.

The purpose of this paper is to make a preliminary comment about these sites from the information we have at hand. Based upon this, the Committee may be able to reject sites from further consideration or identify those that you desire additional information about.

Following are summaries listing the available information and an interpretation of how it would affect each of these sites. It has been assumed that these sites would each have to accommodate 20 million passengers annually.

SOUTHERN SONOMA COUNTY

Access - Using the Napa example, this site could have:

- low average trip distance for passengers using it and the other existing airports, probably about 25 miles for an average trip.
- main access from Marin and Sonoma Counties would be via U.S. 101, and for Napa, Solano, and parts of Contra Costa Counties, I 80, I 680, and State Route 37. All of these routes are now or soon will be freeway.
- there is a BART possibility via Richmond-Vallejo.
- passenger allocation would place about 10 million passengers here without special placement of air service.

Airspace - A large airport at this site would require an airspace reservation of about 12x24 miles. Such an area would affect the positive controlled air traffic at Napa and Hamilton AFB and at least require full coordination of traffic.

- the VFR general aviation airports at Petaluma, Schellville, and Sonoma Valley could be affected.

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* Prepared for the Regional Airport Systems Study Committee March 20, 1972

- the planned ILS approach for Napa would cross the new site approach and the new departure might involve the Sonoma County programmed ILS approach path.

Capital Cost - Using the Hollister I example (without transit), the cost would be about $500,000,000 for a new airport.

Economic Impact - Using Alternative 10 which involved SFO, OAK, SJC, and Napa, it appears that this site could offer a high economic advantage for the Bay Area as a whole, and to Marin, Sonoma, and Napa Counties in particular.

Environmental Impact - Because of its remote location and the existing rural land uses, noise would not be a problem today. However, existing zoning would allow residences in this area.

- the air quality report would identify this as being an area between zones III and IV; that is, between a moderate and heavy air pollution potential.
- this site would be inland and would not involve the Bay or its shoreline.
- the Wilsey and Ham report identifies this area as part of a proposed natural preservation area.
- a portion of the site is identified in the ABAG Regional Plan as open space with controlled development, and the other portion as permanent open space.

MID-BAY

(assumes the use of existing SFO and OAK as passenger processing areas)

Access

- based on the SFO, OAK, and SJC alternative, this site would have high accessibility to passengers.
- a major highway connection, probably from the Hayward/San Mateo Bridge, would have to be provided.
- BART connections from the existing SFO/OAK airports would need to cross navigable waterways.

Airspace

- this location would have a profound affect upon the air traffic of all of the existing airports in the central Bay Area. The overall effect might be to nearly substitute the capacity at SFO and OAK for that of the new mid-Bay site.
- NAS Alameda would probably operate on a one-for-one basis with the traffic at this site, as would NAS Moffett Field.
- SJC, with coordination, might be able to operate unrestricted.

Capital Cost

- the acreage of Bay fill for a four runway airport with no terminal area is 2,000 acres, and with terminal area, 4,000 acres. This would provide for 40 million annual passengers and would replace SFO and OAK runways. These areas include dikes and access routes. Assuming the Bay land in public ownership, and using the unit cost at OAK, the cost for fill alone would be on the order of:
  2,000 acres = $58 million ($29,000/acre)
  4,000 acres =$116 million

- to these costs would be added the airfield development cost, terminal costs, and a sizeable cost of obtaining access.

Economic Impact

- would be one of the highest for the Bay with respect to jobs, housing, employment
- primary benefiting counties would be Alameda, Santa Clara, and San Mateo

Environmental Impact

- would not affect existing shoreline
- would be the largest Bay fill alternative of any in the study
- would have a large effect in reducing water surface area
- deeper water portions of the Bay are apparently less of an environmental concern than shallower portions.
- a change in the tidal prism in the south central Bay would occur.
- least noise impact of the central Bay airport sites
- would be at the northern edge of the proposed South Bay Wildlife Refuge. Approaches would be between 2,500' and 5,000' feet over the refuge.
- would probably be identified as a zone III for air quality considerations (moderate air pollution potential). Downwind, the San Jose area is between zone IV and V (heavy to severe air pollution potential).
- neither the Regional Plan nor the Wilsey and Ham report shows significant environmental issues other than Bay fill.

EASTERN CONTRA COSTA COUNTY

Access

- this site is somewhat similar to Travis AFB in the alternative which has SFO, OAK, SJC, and Travis. This would then suggest an average trip distance of 39 miles.

- about 40% of the schedules would have to be uniquely placed at this site to assure its use. Those having to use it would have an average trip distance of about 70 miles one way.
- highway access would be via I 680, I 80, State Route 4, and U.S. 50. These are or will be freeways.
- the nearest first stage BART stations will be at Fremont and Concord with possible future extensions to Antioch and Livermore. No major BART water crossings would be required.

Airspace

- would be well clear of any Bay Area air traffic, including Stockton.
- would require air traffic coordination with enroute eastbound air traffic.

Capital Cost

- Using Hollister as a guide (without transit), cost would be about $430,000,000.

Economic Impact

- centered in Contra Costa and San Joaquin Counties
- removal of valuable agricultural lands

Environmental Impact

- generally rural in character with some small urbanization in the communities of Byron and Brentwood - noise impact moderate.
- air quality has no apparent problems
- no Bay fill required
- the Regional Plan has a mix of controlled development and permanent open space plus some residential
- Wilsey and Ham identifies a high environmental sensitivity with some proposed natural preservation areas.

POTENTIAL FOR CALIFORNIA CORRIDOR AIRLINE SERVICE TO THE NORTH BAY COUNTIES*

The 1968 and projected airline passenger demand in the northern county area is:

County	1968 Local Passengers (000) Total	% of Bay Total	Corridor passengers (37%)	1975 Local Passengers (000) Total	% of Bay Total	Corridor passengers (35.1%)	1985 Local Passengers (000) Total	% of Bay Total	Corridor passengers (35%)
Marin	341	2.6	126	1,270	4.8	450	4,620	7.5	1,620
Napa	52	0.4	19	320	1.2	110	1,090	1.8	380
Solano	133	1.0	49	480	1.8	170	1,980	3.2	540
Sonoma	185	1.4	69	640	2.4	230	2,420	3.9	850
TOTAL	711	5.4	263	2,710	10.2	960	10,110	16.4	3,390

The existing large airports in this area are:

Hamilton Air Force Base, Novato
Sonoma County, Santa Rosa
Napa County, Napa

The following is an estimate of the proportion of each county's corridor traffic that each of these airports might attract (in millions):

Airport	Marin Corridor Passengers %	1975	1985	Napa Corridor Passengers %	1975	1985	Solano Corridor Passengers %	1975	1985	Sonoma Corridor Passengers %	1975	1985	TOTAL Corridor Passengers 1975	1985
Hamilton	90	0.4	1.4	80	0.1	0.3	20	0	0.1	90	0.2	0.7	0.7	2.5
Sonoma Co.	20	0.1	0.3	20	0	0.1	0	0	0	90	0.2	0.7	0.3	1.1
Napa Co.	60	0.3	1.0	100	0.1	0.4	30	0.1	0.2	50	0.1	0.4	0.6	2.0

* Prepared for the Regional Airport Systems Study Committee April 7, 1972

This particular estimate would identify Hamilton as being able to accommodate the largest number of passengers, if the assumption of the distribution of passenger choice is reasonable and if the relative passenger growth projections in each county are appropriate. If it were assumed that Napa airport might uniquely draw a portion of Contra Costa County passengers, then Hamilton and Napa would be similar.

A recap of the status of each of these airports is as follows:

Hamilton Air Force Base - is currently an active military facility with about 60,000 annual aircraft operations. The capacity analysis suggests an additional capability for 70,000 annual civilian operations or about 4.5 million annual passengers, if no 747 type aircraft are in the mix. Some airspace conflict would occur with NAS Alameda.

The County of Marin has made a preliminary contact with the Air Force relative to joint military/civil use of Hamilton. No firm agreement has been reached to date. Department of Defense representatives at local airspace utilization committee meetings indicate a reasonable possibility for joint use, but the initiative action and financial responsibility must come from a local governmental sponsor.

The physical plant has a major radar control capability, an 8000' runway, an ILS, and approach lighting system and is completely equipped for jet airline service.

The noise evaluations indicate, at least theoretically, that a civilian jet traffic load would have no noticeable effect beyond that now existing. The reason for this is that the individual military jet operations are so much louder (many using after burners) that, despite an equal number of civilian operations, the military events would dominate the NEF contours.

Sonoma County - has a history of airline service dating to the late 1940's. Currently it has limited jet service by Air West and service by two third level carriers. The FAA has programmed an ILS and approach light system installation within the next two years. Current operations are predominantly general aviation. Airspace would not be a problem. Capacity could easily accommodate the 1.1 million corridor passengers projected for 1985.

The airport is located some distance from Santa Rosa and limited civil jet operations would not have a major noise impact on existing land uses.

Napa County - this airport, in conjunction with SFO, OAK, and SJC, actually provided the minimum average ground travel distance (21 miles) of any of the original airport alternatives.

The airport master plan through stage IV has been adopted by the Board of Supervisors and would envisage jet airline operations with about 1 million passengers annually.

The FAA has planned an ILS for Napa. The planned runway system is capable of handling the projected demand but airspace coordination is required between Hamilton and Napa arrivals particularly if steep approaches to Napa would not be possible.

Napa has not had heavy airline jet operations and, while the area around the airport today is open, increased noise levels will be a major concern.

RECOMMENDATION FOR A FUTURE NORTHERN COUNTIES AIRLINE SERVICE POINT*

The staff paper of April 7 estimated the future demand for California Corridor service which each of three airports might attract from Marin, Napa, Solano, and Sonoma Counties.

At its April 7 meeting, the Committee requested staff to further refine this for a specific recommendation for airline service points.

The staff recommends as follows:

The level of future demand for corridor service (estimated for the northern counties as 1.0 to 2.5 million annual passengers) is sufficiently high to support service, although it would not significantly relieve the regional demand forecast of 72 million annual passengers.

This would suggest that the decision of corridor service is a matter of local determination based upon the judgment of travel benefits vs. community impact.

As a general airspace comment, the FAA has indicated that any corridor service to a northern county airport that required a stop at SFO, OAK, or SJC would create a serious airspace problem in the mid-Bay.

With respect to general aviation demand, there is a significant role for Napa and Sonoma County airports.

Sonoma County

This airport would uniquely serve the northernmost areas and would offer a limited advantage to Napa and Marin County residents. It is suggested that corridor service here will depend upon what happens at Napa or Hamilton.

Napa County

The passenger demand here could be greater than that shown in the April 7 paper when portions of Contra Costa County are included. This was also true when Napa was included as a regional service point. The Napa potential would be reduced, however, if the Committee identifies airline service for Travis AFB.

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* Prepared for the Regional Airport Systems Study Committee April 20, 1972

The airspace in the San Pablo Bay area is a problem if jet aircraft traffic serves both Hamilton and Napa, particularly if Runway 18 departures are used at Napa for noise abatement purposes.

The Napa Valley area has not been exposed to heavy jet operations. If a choice would have to be made, then, based upon these factors I would identify Napa as the second most likely service point for corridor service to the northern counties.

Hamilton AFB

Of the three corridor service points, this airport potentially would serve the largest number of passengers. It has a history of military jet operations with high noise levels. Citizen concern at the hearings seemed to focus on the ability to control the level of civil jet aircraft activity to just the Corridor service.

Because of the military ownership of Hamilton, the actual availability is a question at this time, although indications seem to favor joint use.

Hamilton has a prior airspace usage that could accommodate civil jet aircraft.

Either Hamilton or Napa Airport could provide a service point for the California Corridor. If a selection had to be made, I would identify Hamilton as having the best potential in the northern counties for airline service in the corridor.

AN EVALUATION OF THE BAY AREA MILITARY AIRPORTS*

Included in the initial airport alternatives were Hamilton and Travis Air Force Bases. The Committee has asked the staff to prepare a preliminary evaluation of the potential for civilian use of Naval Air Stations Alameda and Moffett Field, and for Crissy Field, a U.S. Army facility at the Presidio.

ALAMEDA

Background

NAS Alameda is a major West Coast naval air facility, one of the two deep-water carrier ports the Navy has on the West Coast. The Naval Air Rework Facility (NARF) located at NAS Alameda provides aircraft maintenance for many naval air activities on the West Coast. NAS Alameda has a total of approximately 9,100 employees (1,300 military, 1,800 civilian, and 6,000 at the NARF). There are approximately 1,500 additional naval personnel attached to the fleet squadrons homebased at NAS Alameda. The Naval Air Reserve uses Alameda as their Bay Area training center.

The physical plant includes two runways, 7200' and 8000' in length, with a combined activity level of about 140,000 annual operations. There is a direct airspace relationship between OAK traffic and Alameda's, which, in a positive control environment, requires a one-for-one handling of certain flights.

Noise contours would suggest minimal impact on certain parts of the cities of Alameda and Oakland, and a larger impact on the Seventh Street Terminal area and Yerba Bueno and Treasure Islands. There would also be a flight-path departure impact on the Berkeley area.

Staff Comment

NAS Alameda is a major naval facility with unique features not available to the Navy in other locations. Light attack aircraft squadrons from carriers utilize NAS Lemoore, thereby reducing somewhat the noise and air traffic impact on the Bay Area. There still remains at Alameda fleet squadrons, maintenance, test flights, and naval reserve training.

The geographic location and the air traffic relationship to OAK offer no unique advantage for civil use that does not now exist at OAK.

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* Prepared for the Regional Airport Systems Study Committee April 17, 1972

MOFFETT FIELD

Background

This naval airport has operational squadrons of anti-submarine turbo-prop patrol aircraft stationed there as well as the Ames Laboratories of NASA. The total annual operations in 1968 were 114,000. The military employment is 650, civilian is 420, and NASA-Ames is 1763. Additionally, of the many units which rotate to Pacific bases, approximately 2500 military personnel are always homebased at Moffett.

There are dual runways, the longer of which is 9200' in length. With some integrated traffic procedures, SJC and Moffett are able to operate without interference.

The Committee has been furnished with a copy of the City of Sunnyvale's resolution 166072 which opposes the "increase in size, intensity of use, or number of jetcraft using the airfield, either while under the jurisdiction of the U.S. Navy or in any subsequent civilian operation." In checking with military channels, Cdr. William Barker, representing the Department of Defense on the Committee, can at this time find no plans to terminate usage by the Navy.

Noise within the communities of Sunnyvale and Mt. View is not as great as it was in the 1950's when fighter type aircraft were regularly operating into and out of NAS Moffett. There was no noise analysis done for Moffett by the RASS contractor.

Staff Comment

Moffett was not included in the original analysis of alternatives because it offered no unique access, noise abatement, cost, or capacity features not already available at SJC or Site E. The Committee has recently removed Site E from active consideration and has been cautioned by San Jose that environmental considerations may limit SJC to less than its runway capacity. Because of this, it may now be worthwhile for the Committee to identify the possibility of a future need of Moffett for capacity purposes. If the facility should become available for civil use at a later date, the conditions of community need vs. impact could be reviewed. At that time, it may be possible to integrate use of Moffett with SJC. In the meantime, no need to consider NAS Moffett Field for joint use would seem necessary.

CRISSY FIELD

Background

The 2600' long runway serves as a small airplane/helicopter airport for access to the Presidio. There is a very low level of activity, estimated to be about 5000 annual operations. The high terrain at one end and the high incidence of fog provide some constraints on the use of the airport.

The preliminary plans for the Golden Gate National Recreation area include this area. NORCALSTOL included Crissy in their evaluations. Access, land use, community structure, noise, and weather conditions were identified as major problems. Airspace separation from other Bay Area traffic depends heavily upon future air navigation capabilities and a highly maneuverable aircraft.

Staff Comment

Its current low level of use for military liaison is appropriate to its location and it does not appear to have any significant civil use as far as air travel to and from the Region is concerned.

ALTERNATIVES REVISION # 1*

ASSUMPTIONS AND CONSTRAINTS

Revision

Revision #1 includes the remaining airport sites and reflects the new passenger projections as well as the following assumptions, constraints, and qualifications.

1. Passenger Projections (millions)

1975	31 **
1980	47 **
1985	72

2. Airport Capacities and Runway Requirements

Airport	Annual Passengers (millions)	Runways
San Francisco (SFO)	33 and below	Existing
	36	One additional
	43	One new close in and one additional set of two separated for simultaneous use
Oakland (OAK)	13 and below	Existing
	17	Existing configuration with constraints***
	24	One additional close in***
San Jose (SJC)	8-11	Existing
Travis Air Force Base	2-9	Existing military - dual
	13	Additional civilian runway
	30	Additional civilian runway with "combined use" of military runway

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* Prepared for the Regional Airport Systems Study Committee April 19, 1972

** These numbers reflect an error in computation here, but were revised in alternative revisions #2, 3, and 4. They should be 28 for 1975 and 44 for 1980.

*** No large aircraft separation requirements and no traffic conflicts from NAS Alameda or Hayward.

		Alternatives - #1								
										*
1985	Airport	1	2	3	4	5	6	7	8	9
	San Francisco	33	28	28	22	22	32	33	31	43
	Oakland	31	26	28	24	29	13	13	31	18
	San Jose	8	8	8	8	8	3	8	8	11
	Travis/Contra Costa			7	18	13	24	18		
	Napa		10	1						
	Northern Counties								2	
	1985 TOTAL	72	72	72	72	72	72	72	72	72
									*	
1980	San Francisco	23	26	20	22	31	30	27	36	
	Oakland	18	13	13	13	13	7	13	7	
	San Jose	6	7	6	8	3	6	6	4	
	Travis/Contra Costa			8	4		4			
	Napa		1							
	Northern Counties							1		
	1980 TOTAL	47	47	47	47	47	47	47	47	
						*				
1975	San Francisco	17	17	20	20	26				
	Oakland	9	7	6	7	3				
	San Jose	5	5	3	4	2				
	Travis/Contra Costa		2	2						
	1975 TOTAL	31	31	31	31	31				
1970	San Francisco	13.9								
	Oakland	2.0								
	San Jose	1.6								
	1970 TOTAL	17.5								

* Air Transport Association percentages for SFO, OAK, and SJC applied to RASS passenger forecasts result in the allocations shown in the last columns.

Airport	Annual Passengers (millions)	Runways
New Contra Costa County airport	14	One runway
	24	Two runways
	30	Three runways
Napa County	2-10	Existing
Sonoma County	2	Existing
Hamilton Air Force Base	2	Existing

3. San Jose Municipal Airport

   3.6 million annual passengers - City Council's present expansion program

   8.0 million annual passengers - J. Nissen's warning of a not-to-exceed level due to environmental constraints

4. Oakland/San Jose (OAK/SJC)

   Interchangeable passenger allocation for 1975 short run

5. Northern Counties

   Account for small part of regional traffic and cannot be counted on to meet regional growth beyond locally generated California Corridor traffic

   Option left open to local sponsorship or local veto

6. Alternative #9

   Reflects Air Transport Association percentages for SFO, OAK, and SJC applied to adopted forecast:

	1975	1980	1985
SFO	84%	76%	60%
OAK	10%	16%	26%
SJC	6%	8%	14%

ALTERNATIVES REVISION #2*

ASSUMPTIONS AND CONSTRAINTS

Following consideration of eleven preliminary alternatives, the revisions offer various forecast-matching combinations for the Committee to choose from or change. Each combination has something "right" and "wrong" with it - noise, Bay fill, access, capital cost, etc. - to some degree.

Revision #1 reflected the Committee's passenger projection divided among remaining airport sites as well as stated major assumptions, constraints, and qualifications. It tried to show a "reasonable" transition in its evolution of alternatives from 1970 to 1975-1980-1985. It drew helpful comments which are reflected in Revision #2.

Revision #2 anticipates the Committee directing staff to focus on select combinations for more detailed evaluations.

MAJOR ASSUMPTIONS, CONSTRAINTS, AND QUALIFICATIONS

1. Passenger Projections (millions)

1975	28
1980	44
1985	72

2. Airport Capacities and Runway Requirements

Airport	Annual Passengers (millions)	Runways
San Francisco (SFO)	28.5 and below	Existing
	33	Existing**
	36	One additional
	43	***
Oakland (OAK)	13 and below	Existing
	19	Existing**
	24	One additional close in
	38	One additional far out

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* Prepared for the Regional Airport Systems Study Committee May 1, 1972

** Improved air traffic control

*** Represents Air Transport Association percentage for SFO applied to RASS passenger forecast

Airport	Annual Passengers (millions)	Runways
San Jose (SJC)	8-11	Existing with extension 30 Right
Moffett Field	8	Existing
Travis Air Force Base	1-2	Existing military-dual
	13	Additional civilian runway
	30	Additional civilian runway with "combined use" of military runway
New Contra Costa County airport	14	One runway
	24	Two runways
Napa County	2-10	Existing
Sonoma County	2	Existing
Hamilton AFB	2	Existing

3. San Jose Municipal Airport

3.6 million annual passengers - City Council's present expansion program

8.0 million annual passengers - J. Nissen's warning of a not-to-be exceeded level due to environmental constraints

4. Oakland/San Jose (OAK/SJC)

Interchangeable passenger allocation for 1975 short run

5. Northern Counties

Account for small part of regional traffic and cannot be counted on to meet regional growth beyond locally generated California Corridor traffic

Option left open to local sponsorship or local veto

6. Alternative #9

Reflects Air Transport Association percentages for SFO, OAK, and SJC applied to adopted forecast:

1985	Airport	1	2	3	4	5	6	7	8	9 *	10	11	12	13
	San Francisco	33	29	28	22	22	32	33	21	43	26	32	32	24
	Oakland	31	24	28	24	29	13	13	31	18	38	24	24	19
	San Jose	8	8	8	8	8	3	8	8	11	8	16		
	San Jose/Moffett												16	16
	Travis/Contra Costa			7	18	13	24	18						13
	Napa		11	1										
	Northern Counties								2					
	1985 TOTAL	72	72	72	72	72	72	72	72	72	72	72	72	72
									*					
1980	San Francisco	23	23	20	23	28	28	24	33					
	Oakland	15	13	13	13	13	7	13	7					
	San Jose	6	7	6	8	3	6	6	4					
	Travis/Contra Costa			5			3							
	Napa		1											
	Northern Counties							1						
	1980 TOTAL	44	44	44	44	44	44	44	44					
						*								
1975	San Francisco	17		19	18	23								
	Oakland	6		6	6	3								
	San Jose	5		3	4	2								
	Travis/Contra Costa													
	1975 TOTAL	28		28	28	28								
1970	San Francisco	13.9												
	Oakland	2.0												
	San Jose	1.6												
	1970 TOTAL	17.5												

* Air Transport Association percentages for SFO, OAK, and SJC applied to passenger forecasts result in the allocation shown in the last columns.

ALTERNATIVES REVISION #3

Year	Airport	1	2	3	4	5	6	7	8	9	10	11
1985	San Francisco	33	27	22	22	32	33	21	26	32	24	32
	Oakland	31	27	24	29	13	13	31	38	24	19	24
	San Jose	8	8	8	8	3	8	8	8			8
	San Jose/Moffett									16	16	
	Travis/Contra Costa		7	18	13	24	18				13	8
	Napa							2				
	Hamilton		3									
	1985 TOTAL	72	72	72	72	72	72	72	72	72	72	72
1980	San Francisco	23	20	23	28	28						
	Oakland	15	13	13	13	7						
	San Jose	6	6	8	3	6						
	Travis/Contra Costa		5			3						
	Napa									1*		
	Hamilton									1*		
	1980 TOTAL	44	44	44	44	44						
1975	San Francisco		19	18								
	Oakland		6	6								
	San Jose		3	4								
	Travis/Contra Costa											
	1975 TOTAL		28	28								
1970	San Francisco	13.9										
	Oakland	2.0										
	San Jose	1.6										
	1970 TOTAL	17.5										

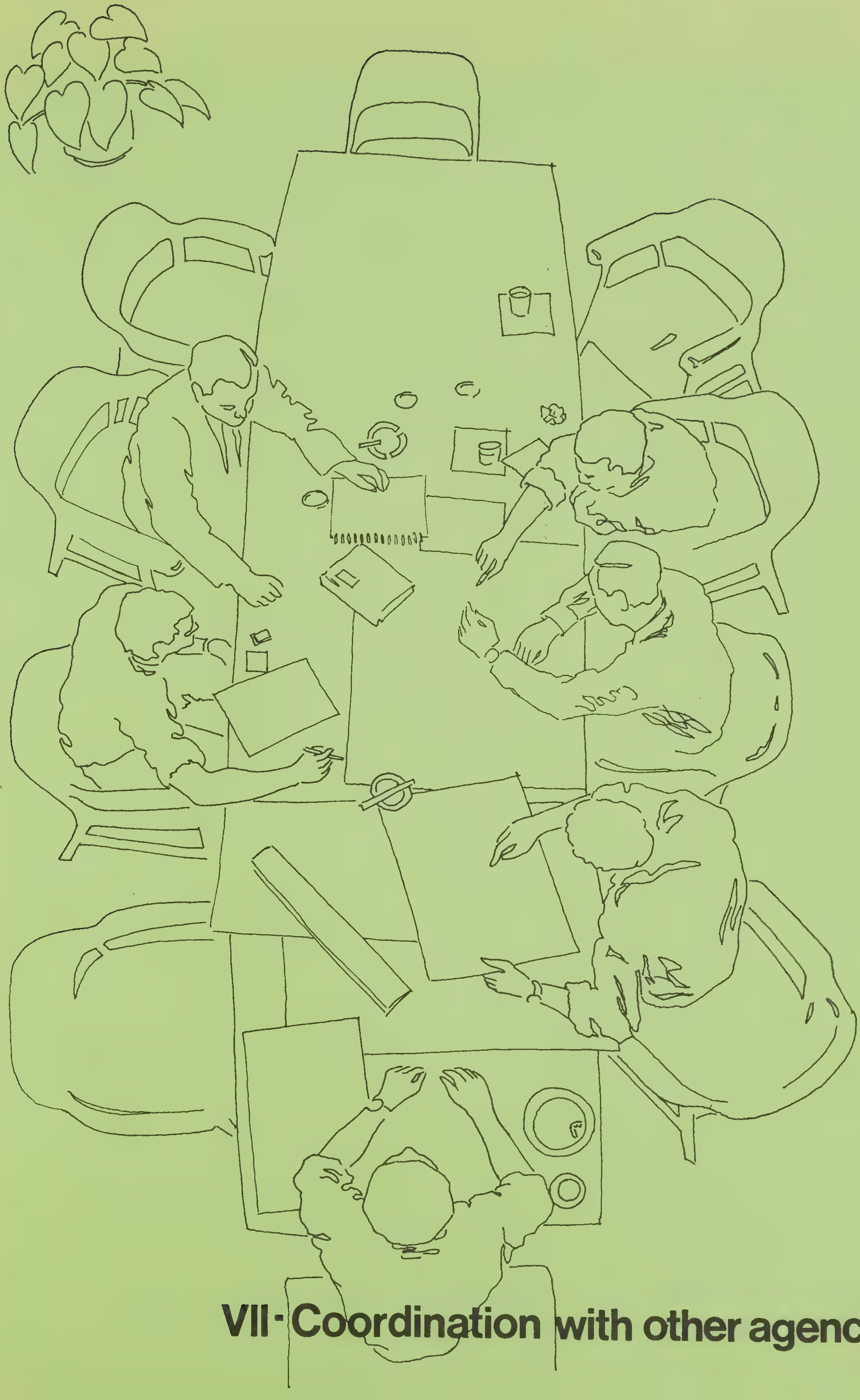
* An early-introduction option of local rather than regional service significance. Such choice would subtract one million passengers from some other airport in the combination selected.

ALTERNATIVES REVISION #4

1985	Airport	1	2	3	4	5	6	7	8	9	10	11
	San Francisco*	33	32	31	26	27	32	30	22	26	33	22
	Oakland	31	28	30	38	27	24	20	29	21	13	24
	San Jose	8		8	8	8	8	8	8		8	8
	San Jose/Moffett		12							12		
	Napa or Hamilton			3		3		3				
	Travis/Contra Costa					7	8	11	13	13	18	18
	1985 TOTAL	72	72	72	72	72	72	72	72	72	72	72
1980	San Francisco	23	20	23								
	Oakland	15	13	13								
	San Jose	6	6	6								
	Travis/Contra Costa		5	2								
	Napa				1**							
	Hamilton				1**							
	1980 TOTAL	44	44	44								
1975	San Francisco	19										
	Oakland	6										
	San Jose	3										
	Travis/Contra Costa											
	1975 TOTAL	28										
1970	San Francisco	13.9										
	Oakland	2.0										
	San Jose	1.6										
	1970 TOTAL	17.5										

* SFO indicated that it is now considering a new north/south runway at the west end of the airport. While such a runway may offer efficiencies in airport operations and noise abatement advantages, RASS analysis would not indicate that it is required for capacity purposes insofar as the Region is concerned.

** An early-introduction option of local rather than regional service significance. Such choice would subtract one million passengers from some other airport in the combination selected.



VII - Coordination with other agencies

COORDINATION WITH OTHER AGENCIES

An integral part of the Study has been continuous coordination with a number of agencies and interested groups. The Committee members themselves were elected officials from nine Bay Area counties and airport managers from San Francisco, Oakland, and San Jose airports.

Open meetings of the Committee were held, with the following organizations acting as ex-officio, advisory, non-voting members: Federal Aviation Administration, S.F. Bay Conservation and Development Commission, Bay Area Rapid Transit District, State of California Business and Transportation Agency and Department of Aeronautics, Bay Area Council, Metropolitan Transportation Commission, Department of Defense, Federal Highway Administration. Input from these ex-officio members included:

- The Federal Aviation Administration provided continuous verbal and written advice on airspace and established a special FAA task force to study airspace problems raised by the Regional Airport Systems Study Committee. * Coordination with FAA also included linking the study into the National Airport Systems Plan.

- S.F. Bay Conservation and Development Commission gave the Committee continuous guidance on its Bay fill permit requirements and the RASSC preliminary alternatives. (See Chapter III for a detailed discussion of the Bay fill positions of BCDC and the Bay Model of the U.S. Army Corps of Engineers.)

- The State Department of Aeronautics was represented at RASSC meetings and public hearings, stressing coordinated aviation planning to bring RASS and the other regional studies into the Statewide Master Plan of Aviation, and specifically discussing noise standards and means of noise measurement.

- The Department of Defense was represented by staff from the Naval Air Station, Alameda giving input on military airspace matters, availability of military bases for partial civilian use, and RASSC preliminary findings.

Throughout the study, contact with other agencies increased. These groups were kept appraised of technical data, preliminary decisions, public response and other parts of the study, in order to have as open and flexible a study as possible. Constant contact was kept with Bay Area airport managers (from county and general aviation airports), with the President's Aviation Advisory Commission, with the Department of Housing and Urban Development (who funded most of the study), with the Air Transport Association, with San Francisco Planning and Urban Renewal Association, with city and county planning departments throughout the

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* O'Brien, Paul J. A Dynamic Simulation Study of Air Traffic Capacity in the San Francisco Bay Terminal Area. August, 1971. FAA-RD-71-37

Bay Area, with environmental groups and interested citizens, with the press, with county airport land use commissions (charged with coordinating land use planning adjacent to airports), and with study sub-contractors such as the Bay Area Air Pollution Control District. These organizations and individuals in turn attended and advised the RASSC at regular meetings, spoke at public hearings, and sent in detailed written comments.

In addition to these groups, there was a core group which sent representatives to most meetings, met with individual Committee and staff members, testified, and provided written input. This group included the League of Women Voters, the Oakland Tribune, the Sierra Club, Save San Francisco Bay Association, and Save Our Valley Action Committee.

The RASSC also met with the Civil Aeronautics Board and the California Public Utilities Commission, because the success of a regional airport system plan will greatly depend upon the successful allocation of traffic to each individual site chosen in order to attain full usage of all facilities. Allocation issues have to be resolved if planned improvements in the Bay Area airport system are to take place. For this reason, the Regional Airport Systems Study Committee met several times with the Civil Aeronautics Board (CAB) in an attempt to determine what kind of assistance it can expect from them.

An exchange of information and opinions was established outside of the Region with Sacramento County and San Benito County over the Travis AFB and Hollister site alternatives.

Coordination was established and information exchanged between the Bay Area and Southern California and San Diego regional aviation studies.

Correspondence follows from the Federal Aviation Administration, the Air Transport Association, San Francisco Bay Conservation and Development Commission, Save San Francisco Bay Association, and San Francisco Bay Area Council:

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

San Francisco Collocated Offices
831 Mitten Road
Burlingame, California 94010

23 May 1972

Mr. Warren Boggess
Chairman of the Regional Airport
Systems Study Committee (RASSC)
Association of Bay Area Governments
Hotel Claremont
Berkeley, California 94705

Dear Mr. Boggess:

As you know the Steering Committee of the Northern California Joint Committee for Airspace Utilization has undertaken a task to make an airspace review of issues related to certain airport alternatives being reviewed by RASSC for possible adoption. Transmitted herewith are the conclusions of that airspace review as discussed at the Northern California Steering Committee meeting 11 May and as presented at the RASSC meeting 19 May by Messrs. Muncy and Brink of the Federal Aviation Administration (FAA). The issues studied are numerically identified below together with the findings.

Issue Number 1 - Impact on Sacramento area airspace of using Travis AFB as a regional jet air carrier airport accommodating up to 404,000 civil instrument operations per year.

This review considered a conservative growth projection to 462,000 instrument operations by 1982 for Sacramento area airports in addition to the proposed Travis AFB operation. With such use of Travis AFB additional airspace would be needed primarily in the eastern quadrant from the air base to accommodate arrival and departure flows. Thus airspace over and adjacent to the Sacramento complex would be involved with operations to and from Travis AFB. However, the study revealed that with some significant changes in the use of that airspace and with the possible provision of some additional navigational aids the Travis AFB operation as identified could be accommodated from an airspace use standpoint. The changes needed in airspace designation and navigational aids have not been specifically identified at this point. Also such use of Travis would be restrictive on instrument operations to the Buchanan Field Airport. It should be noted that the County of Sacramento has reserved their concurrence on this finding pending their further evaluation.

Issue Number 2 - Impact on Bay Area airspace of using Hamilton AFB as a jet air carrier airport accommodating up to 41,800 annual civil instrument operations.

Again, some significant changes would be required in the use of Bay Area airspace as well as navigational aid improvements. Such operations into Hamilton AFB would impact specifically on NAS Alameda traffic and that Sacramento/Travis traffic operating to and from the west. However, with some revisions to current operational procedures and airspace up to 41,800 civil jet operations could be accommodated at Hamilton AFB. This finding is made on the assumption that the bulk of these operations would consist of California corridor traffic (with many of the flights making en route stops at Oakland and San Francisco) or northwest coastal flights to and from the Portland-Seattle market. This finding is also based on the traffic volume at Travis AFB basically remaining as it is today.

Issue Number 3 - The impact on NAS Alameda and Hayward Airport traffic of increased Oakland Airport operations.

The instrument approaches to Alameda Runway 31 and to Hayward Runway 28 directly conflict with instrument arrival and departure procedures at Oakland Airport. The Alameda Runway 31 final approach path and the semi-final maneuvering turn-on airspace crosses the Hayward Airport and the Oakland final approach then approximates a parallel to the 29 ILS Oakland final approach course for 12 miles at altitudes that impact on Oakland arrivals and departures. The analysis has revealed that an instrument arrival to Alameda Runway 31 precludes at least two instrument operations at Oakland Airport. An instrument arrival to Hayward Runway 28 would preclude one instrument operation at Oakland and up to two Oakland operations if low weather ceilings required the protection of a Hayward missed approach. The situation as pertains to Alameda would not be as critical if the Runway 25 complex is being used at Alameda.

This review does not consider Oakland Runway 27 instrument operations which would further compound the problem. Thus it can be seen that Hayward and NAS Alameda operations will have an increasing restrictive influence on Oakland Airport instrument operations as they expand in the future.

Issue Number 4 - Impact on Bay Area airspace of using NAS Moffett as a jet air carrier airport.

Significant airspace conflict would result from expanding the use of Moffett to include civil jet air carriers. The primary airports which would be affected are the San Francisco Airport and the San Jose Airport. Departures from Moffett because of the San Francisco final approach course which lies approximately six miles northwest of the runway must turn either left or right. A left turn places the departure head-on into the low altitude maneuvering airspace for the three major arrival routes to San Francisco from the Los Angeles Basin-Hawaii-Portland/Seattle. Extremely low altitude tunneling would be necessary to even alleviate this conflict and significant

From FAA, p. 2

environmental problems for peninsula cities would be created. Right turns after take-off from Moffett would have to be tunneled under the San Francisco and Oakland arrivals, but more importantly from a capacity standpoint there would be a one to one trade off the San Jose Airport departures. Although arrivals to Moffett would be less of a problem it is believed that Moffett could not sustain a significant amount of civil jet operations without unacceptable disruptionto the total Bay Area traffic flow.

Issue Number 5 - Impact on Bay Area airspace of using the Napa Airport for civil jet air carriers.

Assuming a precision approach navigational aid on Runway 36 at the Napa Airport the maneuvering airspace to final approach directly impacts on the Hamilton AFB final approach and the Alameda and Travis departure areas. Because of the geographical location of the four airports competition for operationally needed altitudes in the vicinity of the Richmond-Crockett area would have a detrimental effect on the capacity of the involved airports proportionate to the volume of operations projected for each.

Issue Number 6 - Impact on Bay Area airspace of using Santa Rosa Airport as a jet air carrier airport accommodating up to 41,800 annual civil instrument operations.

Assuming that Santa Rosa Airport can be included in a pure radar environment procedural development could be effected to sustain a moderate amount of jet air carrier traffic. Although some interaction between Santa Rosa arrivals and Hamilton departures would exist it would be minimal. This conclusion is based on the assumption that the Santa Rosa volume would not exceed the 41,800 instrument operations previously used for Hamilton AFB.

In conclusion it is significant to note that each alternative listed above has a direct airspace impact on other alternatives. In other words the expansion of Travis AFB would adversely affect expansion at either Napa and Hamilton. The expansion of Napa would adversely affect the expansion at Hamilton AFB and Travis AFB. The expansion at Santa Rosa Airport would affect expansion at Hamilton AFB and any expansion at NAS Moffett would adversely affect expansion at any of the three other major Bay Area airports.

Please contact me if there are any questions or if discussion is needed on this report.

Sincerely,

Frank Happy

FRANK HAPPY
Steering Committee Chairman
Northern California Joint Committee for Airspace Utilization

From FAA, p. 3

March 3, 1972

RECEIVED
MAY 1 1972
ASSOCIATION OF
BAY AREA GOVERNMENTS

WRITTEN TESTIMONY SUBMITTED BY THE AIR TRANSPORT ASSOCIATION OF AMERICA COVERING TECHNICAL REPORTS FOR THE SAN FRANCISCO BAY AREA REGIONAL AIRPORT SYSTEMS STUDY

This is a supplement to testimony offered by Mr. John Duba, Vice President, Airport Facilities, Air Transport Association of America, on January 10, 1972 in San Jose, and Mr. M. C. Kronshage, Director, Western Operations, Air Transport Association of America, on February 3, 1972 in San Francisco. We have followed this study since inception beginning with the BASAR organization and into its present development under the auspices of your Committee. We appreciate the opportunities to periodically review the course of the project with Mr. Walter Gillfillan and your consultants.

GENERAL COMMENTS

The hub of aviation activity for Northern California centers in the San Francisco Bay Area. The San Francisco/Los Angeles corridor is today the major air traffic corridor in the United States. For this reason the scheduled air carriers serving the Bay Area feel that the regional aviation system plan developed by your committee could have a wide range effect on their future operations and the availability of air transportation to the public.

The intent of your initial series of public hearings was to receive public reaction to your technical reports and would serve as one of the inputs into the development of the final system plan. We will, therefore, confine most of our comments to the reports and conclude with some of our thoughts regarding the future course of this project.

AIRPORT AND AIRSPACE CAPACITY ANALYSIS

Because of numerous assumptions inherent in the analysis, the airspace and air traffic flow of the future results in a somewhat generalized profile of what capabilities may exist in the 1980's for movement within the airports and airspace in the Bay Area.

The effects of wake turbulence on separation standards will have a far reaching impact on capacity as already demonstrated by FAA "heavy jet" separation standards. The introduction of additional DC-10's and L-1011's in the next few years could, figuratively, upset all airspace capacity quotes addressed at this time.

Our more specific comments are:

(1) We do not believe that the state of the art will be so sophisticated to yield the magnitude of increases resulting from your assumptions under paragraph 3.1.5 of CAAS being in effect and a 6^{o} glide slope being a reality.

(2) In paragraph 4.2.4, we believe that the injection of any appreciable amount of traffic from site "E" would affect all the major Bay Area airports due to the complex interface of departure/arrival routes for SFO/OAK/SJC/MOFFETT/ALAMEDA.

(3) Paragraphs 4.3.4, 4.4.2, and 4.4.3 which respectively address PANCAP for both Hamilton and Travis AFB, may be somewhat optimistic in that under present operating criteria, according FAA Air Traffic, there exists airspace congestion and the capacity figures quoted in the subject report are considerably higher than are now being realized.

(4) Sound abatement is becoming an important ingredient into the airspace problem.

From ATA Testimony

AVIATION EFFECT ON AIR QUALITY

This report is a rational approach to a difficult problem. However, no matter how precise the method may be, the end result will be no better than the input data. Revisions will be necessary to reflect more reliable data as they become available. Such data are, or will shortly be, available for gaseous emissions obtained under EPA sponsorship.

The EPA work, however, did not include anything on particulate matter. We feel that the particulate data produced by the Los Angeles Air Pollution Control District method is unreasonably high and that conclusions based upon its use will prove misleading. This method produces results higher than that of other contemporary methods by a factor as great as 10 or even 20. Since serious problems exist at San Francisco and San Jose, confirmation of these data become important.

As cited on III-3, a uniform 1.56 pounds of SO_2 per 100 gallons of fuel burned was used in this report. This is equivalent to a total sulfur content of .11% by weight. This is high in comparison to fuel boarded at San Francisco. One airline reports the average to be about .04% and .06% systemwide. The sulfur content is expected to trend downward in the future, largely because of the increased use of hydrotreating in turbine fuel production.

The report assumes that average emission factors for commercial turbine aircraft also apply to military fuel usage. To the extent that military engines operate at a comparable engine cycle, this assumption may be justified. However, under afterburning conditions, emission factors are significantly higher. Therefore, emissions attributed to military operations are low by some factor in proportion to the frequency of takeoffs with afterburner in operation.

From ATA Testimony

March 3, 1972

ECONOMIC & SPATIAL IMPACT OF ALTERNATIVE AIRPORT LOCATIONS

Our concern is the general purpose and objective of this report. If the report is to be used to measure the economic impact of alternative systems, then we believe a useful function will be served.

However, if this report is to be used as a tool for income and population redistribution, then the possibility exists that this could be accomplished at the expense of an efficient future aviation system.

It is difficult for us to offer specific comments until more definitive plans are developed.

From ATA Testimony

AVIATION NOISE EVALUATIONS AND PROJECTIONS FOR THE BAY REGION

We feel that there are limitations inherent in the use of NEF's for other than for the most gross planning considerations. Generalized assumptions usually made are:

(1) That an equivalent noise exposure is generated by treating the distribution of actual takeoff flight path profiles as a finite set of single-gradient paths representing several typical gross weights broadly related to stage length.

(2) That the Effective Perceived Noise Levels of an aircraft are uniquely defined by thrust level and distance to observer only.

(3) That arriving and departing of different models of aircraft accurately follow common explicit ground-defined flight tracks, particularly with respect to turns, under varying conditions of winds and aircraft performance.

(4) That tracks delineated by SID's in the immediate vicinity of the airport are explicit. SID's are seldom followed in day-to-day operations. They are followed only when a communication failure develops.

(5) That ILS-IFR type landing approaches prevail for all air carrier operations. (This is certainly not realistic in the SFO Bay region, considering the high percentage VFR weather conditions and the FAA "keep-em high" policy.)

(6) That the noise characteristics of several types of aircraft of a given class can be represented with acceptable accuracy by a single set of noise levels common to all, and that the resulting characteristic curves are equally valid over the entire range and for all operating conditions.

From ATA Testimony

Of the above generalizations several have been identified as having tolerances associated with them of the order of $\pm$ 3 to 4db, and the final contours are frequently held out as having no better than $\pm$ 5db reliability. Furthermore, the value of the NEF study is derogated if the assumptions for future fleet mixes, future aircraft traffic patterns and volume of operations do not represent the best assessment of these factors.

The NEF is described as a "measurement" of community noise environment. In this case they are "computed in", not measured, and even the 1970 contours are presumptions arrived at by calculation.

To our knowledge no NEF analysis of existing operations at any airport has ever been followed up by comprehensive community measurements to verify the reliability of contour locations. We recommend that this be done.

The projections for the number of operations in 1985 may be reasonable. The assumptions on the mix of aircraft types, however, tend to overstate the proportion of operations of the large high-bypass-ratio fan powered aircraft now being introduced into service, particularly at OAK and SJC as well as at SFO. Projections of a more realistic aircraft type deployment would result in a significantly larger number of 3 and 4 engined aircraft (i.e., DC-8, 707, 727) at all three airports, with a cascade effect at OAK and SJC because of saturation at SFO. This will have a critical effect on NEF contours because of the higher noise levels of these aircraft, even with retrofit.

As pointed out by the contractor, actual instrument departure tracks show considerable variation from those inferred solely from standard instrument departure (SID) routes. The same is true of instrument arrival tracks. Both are actively modified in real on-the-spot operations by traffic controllers through the use of radar vector directives, under both instrument and visual flight weather conditions. Hence the use of specific ground tracks for the NEF analysis, although a necessary generalization, imparts yet another source of unreality to the contours. In general, values on the theoretical tracks will be lower, but the contours will bulge and fan more.

An example of a questionable pictorialization appears in the NEF contour plots for OAK. The takeoff flight track 29C is shown as taking an immediate northerly excursion towards Alameda as it proceeds outbound. This excursion is generated by the assumption that R/W29 departures can and do achieve the explicit track geometrically defined by SID's immediately after lift-off. In practice, such micro-maneuvering in the first few miles is seldom attempted or achieved and then only in case of an air-ground communication failure with the aircraft.

From ATA Testimony

The study analyzed the effect at SFO for both 1970 and 1985 operations of transferring more takeoffs from runways 28 L and R to runways 1 L and R by increasing the allowable crosswind component from 15 kts. to 20 kts. Beyond the fact that this increase may not be practical for safety reasons, the analysis shows the relatively insignificant benefits from this avenue of alleviation. The distribution of takeoffs is:

	R/W's 01	R/W's 28	Others
15 Kt. Limitation	62%	33%	5%
20 Kt. Limitation	72%	23%	5%

Thus the reduction in takeoffs on runways 28 L and R is about one third. On the 10 log n basis used in the NEF (and CNEL) this is equivalent to a reduction in value (level) of less than 2 units (db). Obviously, in the interpretative terminology of the study, in which no differentiation for steps less than 5 or 10 units is possible, this type of operational change will not have a substantial effect in the planning process.

The contractor's study assumptions for retrofit of current model turbofan powered aircraft still in operation in 1985 were 6 to 11 EPNdb reduction in approach noise levels and approximately 2 EPNdb reduction in the "sideline" noise levels associated with full takeoff thrust. These reductions may be technically feasible but are economically impractical and should not be a part of the noise computations.

It is unrealistic to assume retrofit of current-day aircraft if large scale replacement by the new technology aircraft is postulated, or conversely, that there will be large scale replacement if retrofit is implemented. In other words, the 1985 projections are unrealistic by assuming both a large percentage of new aircraft and a large percentage of retrofitted aircraft.

The report also implies that retrofit, together with a "cutback" procedure for certification of the takeoff noise, would constitute compliance with FAR 36. It is not possible for turbofan powered DC-8's and 707's at least to achieve FAR 36 compliance, even with cutback, with currently developed noise reduction technology. The most recent studies show that the area within the single event noise contours for nearly all models of transport aircraft are not to use "cut-back" but on the contrary, to use take-off thrust until an altitude of 1,500 feet to 3,000 feet is reached.

From ATA Testimony

The contractor's brief study on this subject indicates that there is little prospect of avoiding localized sensitivities to noise from overflights of areas remote from airports. We cannot comment on the applicability of the ground traffic noise used for comparison in the study. We do observe, however, that calculated aircraft flyover noise levels shown in the report are overstated. Specific measurements reported by FAA agree with the calculated values only for the September 9, 1970, data cited. All the other data collected by FAA at the Woodside locations for example showed considerably lower levels, seldom exceeding 55 db. That same data also shows ambient levels of 4-45 db with sounds of birds registering 50 db, barking dogs at 100-150 feet 54-56 db, and car horns 1/4 mile away, 50-52 db. The point is, comparison of levels is meaningless, for if the sound simply exists audibly, it will be unacceptable to the person who considers it inappropriate.

From ATA Testimony

AIRPORT ACCESS

The Wilbur Smith Report purports as its primary objective the measurement of the ability of existing and planned ground and air transportation systems to serve airport bound traffic and parking demands through 1985. The major portion of the two reports, however, seems bent on the development of a model by which passenger demand is allocated to Bay Area airports.

Without an intimate knowledge of the survey techniques, we will assume that the base year data (mode, trip purpose, O-D, etc.) represent actual conditions. Since no recommendations are offered in the way of ground access improvements, we will comment on the proposed allocation model.

Your assumption that 95% of all Bay Area passengers will have a choice of airport by 1985 does not consider the economic conditions necessary for the airlines to achieve this level of service. Furthermore, a large portion of the arrivals in San Francisco are for business purposes and business traffic cannot be allocated on the basis of local population distributions. We would suggest a breakdown of:

(1) 50% choice of three airports
(2) 20-25% choice of two airports
(3) 25-30% no choice

The ATA San Francisco forecast includes an individual passenger forecast of the top domestic markets at the San Francisco hub. It is a detailed effort to match and allocate supply with forecasted demand. It allows for:

(1) Simulation of airline economic behavior by scheduling flights to specific cities within a state.

(2) Eliminating the need to consider broad groupings of market segments which do not accurately estimate the scheduling picture for future periods.

(3) Specific allocation of traffic on a market by market basis to individual airports within a multiple airport hub.

(4) Corresponding assignment of aircraft types by seat capacity to match the allocated demand.

From ATA Testimony

The ATA method for passenger allocation at a multiple airport hub follows the "overflow" process, i.e., as the first major airport approaches its capacity, the "overflow" goes to other airports. The following is an illustration of how the "overflow" process applies to the San Francisco Hub. As San Francisco approaches capacity, Oakland would begin to take the "overflow." Then, as Oakland approaches its capacity, there would be spillover to San Jose. Additional assumptions are made for international schedules and its split of traffic to the three airports. The highly competitive situation within the industry assures that the individual airlines will continue to test the extension of markets to other airports in a hub. However, expansion of service will be accomplished in increments that can be supported economically and be in line with local airport planning objectives. Setting segment load factors, as low as 20% in 1985, cannot be justified on an economic basis especially in light of the recent Civil Aeronautics Board ruling of a 55% load factor for rate making purposes.

The "overflow" process for forecasting multiple hubs does not consider "passenger convenience" per se but uses a method which effectively simulates airlines' scheduling and is designed to match supply with demand. This scheduling method considers overall airline economic conditions as well as local economic conditions.

From ATA Testimony

AVIATION FORECAST

A most important factor in aviation systems planning is demand forecasting. Projections for fleet mix, noise, air quality, adequacy of ground access, are dependent upon the aviation forecast. There are differences between our forecast and the BASAR Forecast developed by the Systems Analysis Research Corporation.

SARC projects 83 million total passengers for the Bay Area airports by 1985. We show approximately 29.5 million total enplanements by 1985, or, about 59 million total passengers.

A comparison of ATA and SARC long term forecasts of enplaned domestic passengers at San Francisco shows that although different base years were used, the average annual growth rates forecasted by the ATA and SARC through 1985 are reasonably compatible (ATA - 9.1% per year and 10.2% per year for SARC). If the SARC forecast were changed to reflect the more current base data, it is highly probable that the two forecasts would not differ substantially in the absolute volume of traffic forecasted through 1985. As it is now, there is a time difference of four to five years between the ATA and SARC 1985 forecasts, so that the SARC forecast is not achieved by ATA until approximately 1989 or 1990. Likewise, the FAA forecast for 1970-1982 made in 1971 forecasted domestic traffic to increase at a growth rate of 9.17% per year 1970 through 1982. However, just recently the FAA made tentative revisions to their long range forecast to a growth rate of approximately 8.4% per year 1970 through 1982. This latter forecast will bring the FAA absolute volume of traffic forecasted in line with the ATA long range forecast.

Airline traffic has been severely affected by the sharp downturn in the national economy. The persistent business recession which has accompanied this downturn is what caused us to review the total airline industry long range traffic forecasts. The current recession has produced a relatively high level of stagnation, unemployment and inflation. These factors dampened airline traffic growth to the extent that future traffic will not attain the traffic levels forecasted.

The revisions to the ATA airline industry forecasts are the results of evaluating the downward departure from the forecasted longer term trend. The revised forecasts show substantial differences in absolute traffic volumes from the forecasts we made initially. To reflect greater precision in the development of the ATA long range forecasts, more current base year data was used. The initial ATA industry forecasts were based on data prior to 1968. This base period has been changed to a 1970 base for domestic passenger enplanements.

From ATA Testimony

The initial industry forecast used a formula for forecasting that related the rate of change of airline revenues to double the rate of change of personal consumption expenditures. The extension of the revenue trend into the future was made at a growth in personal consumption expenditures of 4.4% annually. The original forecasts in the initial industry report assumed an increase in airline costs and resultant prices of one percentage point less than general prices annually. It is now clear that the original price assumption does not correspond to present reality. In the revised version, airline revenues have been converted to RPM's by adding one percent to the previous 8.8 percent rate for airline revenues.

The estimated passenger enplanements for trunk and local service airlines in the continental U.S. was 150.3 million for the twelve months ending September 30, 1970. If this increases by 9.8% annually, then for the calendar year 1975, the total domestic enplaned passengers would be 214.4 million or 19.4% below the original forecast of 266.1 million. This is an approximate two year slippage in the growth previously anticipated by 1975 in the national economy and subsequent airline traffic growth. In 1980 the industry forecast is 23.5% lower than the previous forecast and in 1985, 25.8% lower. The international passenger forecasts were not revised since the forecasts made originally are not out of line with present expectations.

The methodology of the individual airport hub forecasts relates each airport's growth to the national total. Therefore, current revisions for the San Francisco hub airports are based on changes in the forecasted traffic of national totals. All other relationships and methods of determining traffic were left unchanged.

From ATA Testimony

CAPITAL COST ANALYSIS OF AIRPORT ALTERNATIVES

The significance of this report is its focus on capital improvements for alternate airport systems that do not assume maximizing the full capacity of the three existing Bay Area airports.

Although the cost estimates are purported to be "order of magnitude" for comparison purposes, the discreetness of the numbers will qualify them for use in each individual airport master planning project. We hope that sufficient safeguards will be built into the report so that this will not happen.

One of the basic considerations in studies of this type is capacity. In this context, capacity is a variable that must be weighed against permitting further increases in conjestion or capital expenditure outlays to increase service capacity.

The costs do not include environmental and ecological constraints. Costs associated with the removal of undesirable environmental or ecological factors are generally of considerable dollar impact.

We note that portions of mass transit and highway systems have been allocated as airport costs. Ground access to airports is an integral part of the total regional transportation network and should be planned, constructed, maintained and financed as other segments of the system are. The airports should not be called upon to finance any such ground transportation.

The report assumes that the capital improvements will be paid by public funds and does not take into account the complexities of financing airport improvements.

From ATA Testimony

CONCLUSION

The primary objective of this study should be the development of a regional aviation system plan compatible with established environmental and land use considerations and programmed to meet the best estimate of future aviation demand.

This plan should utilize the full capacity of San Francisco International Airport, Oakland International Airport, and San Jose Municipal Airport, and incremental expansion should be geared to passenger demand, economic feasibility, and environmental considerations while planning for alternate airport locations, once total capacity of the existing system is attained.

The airlines have and are still investing millions of dollars in improvements at San Francisco, Oakland, and San Jose to up-grade service levels at these airports. We believe that our services provide a decided benefit to the community. In developing a plan for the Bay Area, we trust that all factors will be carefully evaluated including the value of these three airports to the local residents and to the airport users.

From ATA Testimony

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BAY AREA GOVERNMENTS

SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION
30 Van Ness Avenue, San Francisco 94102 557-3686

June 23, 1972

TO: All Commissioners and Alternates
FROM: Joseph E. Bodovitz, Executive Director

SUBJECT: REGIONAL AIRPORT PLAN PROPOSED BY ABAG AIRPORT STUDY COMMITTEE (For Commission consideration on July 6)

Introduction. On the Commission's July 6 agenda will be a report on the final recommendations of ABAG's Regional Airport Systems Study Committee (RASSC), which has been headed by Supervisor (and BCDC Commissioner) Warren Boggess of Contra Costa County. A draft of the RASSC's proposed plan is scheduled for distribution during the week of July 3 and public hearings will be held this summer on the proposed plan. The purpose of this memorandum is to explain the staff's analysis of the proposed plan and to recommend the points that the staff believes should be made in a statement on behalf of the Commission at the public hearings.

Summary of Plan. The airport study committee has conducted a thorough study of the many factors that bear on airport planning--limits on airspace, population growth, environmental considerations, ground access to airports, etc. In summary, the recommended plan would concentrate future aviation growth at existing airports, with the use of Travis Air Force Base in Solano County for some civilian airport purposes. The only Bay filling recommended in the plan is the construction of an additional runway at the Oakland International Airport to serve the number of passengers expected in 1985; this fill would require some 200 acres of the Bay.

Staff Discussion. Members of the BCDC planning staff have worked closely with the airport study committee, and have made the following points in discussions at committee meetings:

1. Under the law, airports are one of the purposes for which Bay filling is justified, if the Commission finds that there is no alternative upland site, that the filling is the minimum necessary to achieve the purpose, and that the fill is designed so as to minimize harmful effects on the Bay. Under the law, the burden of proof is on the applicant.

2. The staff believes that projections of the numbers of airline passengers to be served by Bay Area airports should be based upon commonly-accepted regional population projections. Such population projections would in turn be based on an adopted urban growth policy for the Bay Area. RASSC originally estimated the 1985 passenger levels at 83 million, but on the basis of State Department of Finance provisional projections, lowered the estimate to 72 million passengers (the present level is around 20 million passengers). This reinforces the need for common agreement on such projections related to adopted regional growth policies. The Association of Bay Area Governments has proposed to work toward developing both regional population projections and a regional urban growth policy in its 1972-73 planning program. Until such projections and

policies have been agreed upon, the staff believes it would be unwise to make irrevocable commitments to airport expansion that would require extensive Bay fill. Rather, provisions should be made in any RASSC recommendations for the review of passenger projections and airport expansion proposals in relation to the future projections and urban growth policy.

3. Much Bay Area aviation consists of flights in the "California corridor," between the Bay Area and Southern California. One alternative is to concentrate this traffic at existing airports, which could require Bay fill. Another is to disperse these flights among other and smaller Bay Area airports such as Hamilton Air Force Base; there might be considerable opposition to this second alternative from the communities that would be receiving the new flights. A third alternative worth considering is the possibility in the long-run of building high-speed rail transport to Southern California.

4. While nobody can minimize the unpleasantness of aircraft noise, this alone should not, the staff believes, constitute a reason to fill the Bay. Future improvements in the technology of aircraft engines should be the means of solving the noise problem. But Bay filling to solve a temporary problem will reduce the surface area of the Bay permanently.

5. The recommended airport plan does not automatically constitute an application for fill at the Oakland airport. Oakland airport officials state that if the proposed plan is approved, they would begin detailed environmental studies, perhaps requiring several years. It is important to emphasize that the recommended plan calls for the new runway at Oakland not to be built at once but to be in service for the anticipated level of passengers expected in 1985. Even to meet the level of service proposed in the plan, construction of the runway would not have to begin for several years.

Staff Recommendation. The staff recommends that these points be adopted as a general policy statement by the Commission for presentation at one of the forthcoming public hearings on the airport plan.

From BCDC, p. 2

January, 1972

Save San Francisco Bay Association
P.O. Box 925, Berkeley, Ca. 94701

URGENT! URGENT!

ABAG has been studying plans for possible future expansion of airport facilities. Some of the alternatives for new airports or expansion of existing facilities include Bay fill - as much as 1500 acres, an area larger than Golden Gate park!

A public hearing in San Francisco on February 3, 1972 at 9:30 a.m. in Room 1194 of the State Building (455 Golden Gate Ave.) will allow citizens to show, by attendance, their concern about the desirability of great airport expansion within the fragile environmental area of the Bay Basin.

A written statement of your opinion can also be sent to:
Airport Study, ABAG, Claremont Hotel, Berkeley, Ca. 94705.

April, 1972

To: Members

This is to alert you to the importance of a decision which the airport committee of the Association of Bay Area Governments will be making in the next few weeks on future expansion of Bay Area airports.

Some of the alternatives being considered require as much as two square miles of new Bay fill. Other alternatives which are feasible do not require any Bay fill. Before the present Bay Area airports reach their capacities, (10 - 20 years), the use of Travis AFB as a new regional facility should be more thoroughly explored.

Expressing your opinion now is important since letters and telegrams are being tabulated. One of the categories is opposition to Bay fill.

Address: Mr. Warren Boggess
Executive Committee, ABAG
Hotel Claremont
Berkeley, Ca. 94705

San Francisco Bay Area Council

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January 10, 1972

Regional Airport Systems Study Committee
Association of Bay Area Governments
Hotel Clarement
Berkeley, California 94705

Gentlemen:

The San Francisco Bay Area Council is a private, non-profit organization dedicated to the civic, economic and environmental enhancement of the nine-county Bay region. One of the principal areas of interest of the Council is the promotion of a comprehensive regional transportation system including a suitable airport and aviation network for our area.

We have been following closely the deliberations of your Committee and we wish to thank you for allowing the Council to occupy an ex-officio position in the person of Mr. C. F. Gregg, Public Affairs Director of the West Coast, Pan American World Airways, and a member of our Transportation Committee.

Secondly, we wish to commend the Committee for the fine work it has performed thus far in this study.

The Bay Area Council has formed a special Task Force to review the goals, policies, issue papers, technical reports and decision criteria of RASSC. As an initial step, the Task Force has reviewed the statement of goals and policies published in your "Regional Airport Systems Study's Report to the General Assembly of the Association of Bay Area Governments" and in your publication "Aviation Future." These statements of policies dealing with "Aviation Transportation and Service; Economic Vitality; and Environmental Quality" are necessarily very broad. Since they are, any option, consideration or decision dealing with airports and aviation can be accommodated, depending upon the subjective evaluations and priorities of the decision makers. We are currently looking at the various "issue papers" and technical reports prepared by and for RASSC. We also await the statements of "decision criteria" your Committee will be considering. We anticipate that these will provide more tangible basis for further study and comment.

The Bay Area Council, established in 1945, is supported mainly by business with participation from government, labor and education and is dedicated to building a better Bay Area through economic, environmental and civic development, and regional cooperation.

The following brief general statement is intended to demonstrate our interest in this matter and to serve as an introduction to a more definitive statement to be submitted at a later date.

1. Good planning must acknowledge the interrelationship among all elements of land use. We do not believe that airport planning can be divorced from total transportation planning; nor that transportation planning can be independent of over-all land use policy and planning. Therefore, while we fully acknowledge the great importance of regional airport planning, we believe your Committee's mandate is too restricted. We suggest to you that: (a) the proper function of your Committee is to take a realistic view of the need for expanding aviation facilities in the Bay Area, (b) the basic questions of land use policy and of population and development controls should not be decided by your Committee, (c) the results of your Committee's work should not be adopted until they have been integrated with other elements of the ABAG Regional Plan, and especially with a comprehensive transportation plan, and, (d) the results of your work should be reviewed by the Metropolitan Transportation Commission, the establishment of which the Council supported.

2. An effective method of implementation is essential to the ultimate success of a comprehensive planning program. The RASSC Plan, like any other, will be relatively useless unless a mechanism is established for its implementation. We believe there must be not only coordination among aviation and airport facilities in our region but also coordination with other transportation and land use decisions. Again, we suggest MTC as a possible implementation vehicle.

3. So far we have found no evidence to dispute that first priority should be given to maximum feasible development of the existing San Francisco, Oakland and San Jose airports. The Council advocates strongly that these existing centers of aviation activity, of extensive public and private investment, and of intensive employment be protected, enhanced and developed to their optimum utilization. We know, of course, that the expansion of these airports is likely to raise questions about environmental impact. But, we are certain that these environmental considerations can be reconciled with regional transportation service and safety requirements and with economic considerations.

We appreciate the opportunity to deliver this statement to you. As indicated previously, it is intended to serve primarily as an introduction to a more detailed review we are currently engaged in. We request that you accept and consider our subsequent statement, even though it will be delivered to you after the public hearings have been adjourned.

Sincerely,

(Original signed by)

A. W. Clausen
Chairman

AWC:mvn

* From S.F. Bay Area Council, p. 2

VIII - Implementation

CHAPTER VIII

IMPLEMENTATION

Implementation is the phase at which many plans come to a halt. It was an issue raised often during the public hearings and by the ex-officio members of the Study Committee. Many of these questions were directed to the point that ABAG, as a voluntary association, has very limited effect in requiring compliance with its plans.

The Committee was concerned that an adequate definition of its plan bases be available. This they felt to be necessary for the ABAG project review function.

The Committee was also concerned about the lack of procedures for dealing with some of the issues they had worked with, such as seat factors, noise standards, peak-hour scheduling, route awards, and airport service points.

Project Review

The first step in the process of implementation was to clearly establish this aviation plan as an approved special plan element in the Association's Regional Plan. That would form the basis for the Association's comments under its federal project review authority stipulated by the Office of Management and Budget's Circular A-95.* This authority extends to 101 different types of federally assisted projects, ranging from projects with FHA home mortgage insurance to airport development projects.

Such a review gives the Association an opportunity to identify the regional effects of various projects with respect to all elements of its Regional Plan, and to coordinate the removal of conflicts that may appear.

With this authority in mind, the Committee carefully described the decision criteria that it used in developing its plan so that in later reviews of projects the intent of the Committee would be clearly interpreted.

The Forum

The lack of a demonstrated process that brings together the numerous organizations and agencies that deal with aviation issues led the Committee to recommend the creation of a forum. The purpose of this forum is to bring together the airlines, airport owners, regulatory agencies, Federal

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* Excerpts from the Association's report, Project Review Policies and Procedures, May 1971, are included in the back of this chapter.

Aviation Administration, and Bay Area communities to regularly discuss the unresolved issues unearthed by the Committee. These issues included:

- Where can service points for new route awards best fulfill the plan?
- How can seat factors be improved to increase utilization of airports?
- Would a redesignation of airline service points better utilize existing capacity?
- Can improved noise abatement procedures be devised for the entire Bay Area?

Because of the lack of experience with such a forum, the Study Committee has suggested that it begin the process and, with time, evolve the procedures and composition for the forum. The question of including other affected local agencies into the process will be a matter of initial importance.

Monitoring

Because this plan element depends upon many projections and assumptions, the continual monitoring by ABAG staff is particularly important. In this way, new findings that are inconsistent with the Committee's facts or projections can be checked to see how they could change the original decisions. The process for change would focus on amendments to the special plan element.

ASSOCIATION OF BAY AREA GOVERNMENTS

PROJECT REVIEW POLICIES AND PROCEDURES

EXCERPTS

The activities for which the Association has a review responsibility are as follows:

1. The grant-in-aid programs covered in Appendix II of this report (attached).

2. Federal Housing Administration housing programs on the list in Appendix II (attached).

   - Subdivisions of 50 lots or more
   - Multiple family dwellings of 100 units or more
   - Mobile Home Parks of 100 units or more
   - College housing for 200 students or more

3. All Federal development projects undertaken by departments of the federal government including acquisition, use and disposal of federal property.

4. All Federal programs providing assistance to state, regional, and local projects and activities that are planned on a multijurisdictional basis.

The purpose of the project review program is to:

1. Implement regional policies, plans, and programs.

2. Establish a mechanism to insure that all planning activities of local, state, and federal agencies relate to a coordinated and unified regional planning program.

3. Emphasize the intergovernmental relations aspects of federally assisted and federal development projects.

4. Establish a process through which the regional significance, including environmental significance, of a proposed project can be evaluated.

5. Establish by means of early contact between agencies proposing projects and agencies affected by those projects, an expeditious method of review and coordination.

Formal Review and Comment by ABAG

If the Clearinghouse declares interest in formally reviewing the project, this review will be conducted after the project is fully developed but 30 days prior to the submission of the final application to the granting agency.

During the development stages of the proposed project, the Clearinghouse staff may call a pre-application conference as deemed necessary, involving the following parties:

a. ABAG staff
b. Local or regional agencies that have expressed an interest in the project
c. State agencies that have expressed an interest in the project
d. Federal agency involved in the project

Federal Development Projects

The Association is responsible for maintaining coordination between Federal agencies undertaking direct development projects and regional and local agencies affected by such projects. It is the object of such coordination to assure maximum feasible consistency of Federal developments with regional and local plans and programs.

Direct Federal development projects include the planning and construction of Federal buildings and installations and other Federal public works, or developments for the acquisition, use, and disposal of Federal land and real property. Federal agencies which undertake such direct development projects include, but are not limited to, the Department of Defense, General Services Agency, Bureau of Reclamation, Federal Power Commission (review of permits), National Park Services, etc.

The Association shall utilize its Clearinghouse project notification and review procedures to:

a. Notify regional and local agencies at the earliest practicable stage of direct Federal projects or of plans for the development of such projects.

b. Advise Federal agencies of the consistency or inconsistency of such projects or development plans with regional or local agency plans or programs.

c. Provide regional and local agencies authorized to develop and enforce environmental standards with adequate opportunity to review such Federal plans and projects pursuant to section 102 (2), (c) of the National Environmental Policy Act of 1969.

d. Provide Federal agencies with information on the possible impact on the environment of proposed Federal development projects.

Project Review Policy and Criteria

The following criteria and policies shall be utilized in the review of a proposed project. The review of proposed projects by the Association is, in part, a service to agencies in the Bay Area in identifying issues and assisting in their resolution.

Coordination of the regional planning policies and objectives of the Association with geographically larger state activities, geographically smaller local activities and the activities of specialized planning and regulatory agencies in the Bay Area is a positive goal. The specialized technical resources of such agencies will be utilized to the maximum extent possible by the Association to avoid duplication of effort and overlap, and their policy proposals will be given appropriate consideration.

In its review of project applications, the Association shall consider and take account of all pertinent findings and decisions of all Bay Area specialized planning or regulatory agencies and Bay Area general purpose units of local government whose comment upon or approval of the project is required by law. The Association may request comments from such organizations when it believes them to be pertinent in the event they are not required by law.

The Executive Director shall cause project applications to be referred for consideration and recommendation to appropriate advisory and/or technical committees of the Association when he believes that to be desirable and practical within the applicable time limits and the intent of this policy.

The following policy and criteria shall govern the Association's Project Review Program:

1. ABAG Regional Plan 1970:90

   All proposed projects shall be reviewed as they relate to the fulfillment of the Regional Plan 1970:90, as approved by ABAG July 30, 1970. The goals and policies as articulated in the Regional Plan are summarized below:

   > To protect and enhance the quality of life in the San Francisco Bay Region. The city-centered concept for regional growth, development and environmental quality shall be the focal point of the Association's project review program.

2. Special Element Plans

   As special element plans are developed and policy is established, they shall become an integral part of the Association's review.

3. Other Agency Plans and Policies

   Where a functionally specialized planning or regulatory agency exists and its plans and policies are found to be consistent with ABAG policies, said plans shall be utilized as the criteria for the review of projects which relate directly to those functionally specialized plans.

4. Environmental Impact

Projects shall be reviewed as they may have an impact on the environment of the Bay Area. Consideration shall be given, but limited to, the following factors as spelled out in Section 102 (2), (c) of the Environmental Policy Act of 1969:

a. the environmental impact of the proposed project;
b. any adverse environmental effects which cannot be avoided should the proposed project be implemented;
c. alternatives to the proposed project;
d. the relationship between local short term uses of man's environment and the maintenance and enhancement of long-term productivity;
e. any irreversible and irretrievable committments of resources which would be involved in the proposed project or action should it be implemented;
f. the extent to which a project will have an adverse effect on the Bay Area environment. Specialized planning and regulatory agencies shall be utilized to the extent necessary in developing comments relative to the potential adverse environmental impact of a proposed project.

5. Coordination of Planning Activities in the Bay Area

The Association has the responsibility to provide for a coordinative planning program which relates all areawide planning by specialized agencies to a Comprehensive Regional Plan. The following policy and criteria shall be utilized to the extent necessary in determining the extent to which a project contributes to the fulfillment of the Association's program for a unified and Comprehensive Regional Plan.

a. Insure that planning activities are not duplicative of existing programs;

b. Insure that common or consistent planning jurisdictions are established on the basis of the nine county Bay Area;

c. Insure that common and consistent data bases are utilized in the development of specialized plans;

d. Provide evidence of explicit organizational or procedural arrangements for a continuing monitoring process between ABAG and the project proponent;

e. Where it is found to enhance the quality of proposed planning activities, and the comprehensive scope of such activities, applicants shall provide for joint funding of a project with the Association's Regional Planning Program.

PROJECT REVIEW POLICIES AND PROCEDURES

APPENDIX II

Federal Assistance Programs Covered Under
the Project Review Program

Department of Agriculture

Comprehensive Areawide Water and Sewer Planning Grants
Irrigation, Drainage and Other Soil and Conservation Loans
Recreation Association Loans
Water and Waste Disposal Systems for Rural Communities
Watershed Protection and Flood Prevention Loans
Resource Conservation and Development
Watershed Protection and Flood Prevention

Department of Commerce

Economic Development - Grants and Loans for Public Works and Development Facilities
Economic Development - Planning Assistance
Economic Development - Technical Assistance

Department of Defense - Army Corps of Engineers

Beach Erosion Control
Small Flood Control Projects
Small Navigation Projects
Snagging and Clearing for Flood Control

Environmental Protection Agency

Air Pollution Control Program Grants (Planning Only)
Solid Wastes Demonstration Grants
Solid Wastes Planning Grants
Construction Grants for Wastewater Treatment Works
Water Pollution Control - Comprehensive Basin Planning Grants
Water Pollution Control - State and Interstate Program Grants

Department of Health, Education and Welfare

Comprehensive Health Planning - Areawide Grants
Health Facilities Construction - Diagnostic and Treatment Centers
Health Facilities Construction - Hospitals and Public Health Centers
Health Facilities Construction - Long-Term Care Facilities
Health Facilities Construction - Rehabilitation Facilities

Mental Health - Community Assistance Grants for Narcotic Addiction (Construction Only)
Mental Health - Construction of Community Mental Health Centers
Regional Medical Programs - Operational and Planning Grants (Planning and Construction Only)
Health Professions Facilities Construction
Medical Library Assistance - Regional Medical Libraries
Schools of Nursing - Facilities Construction
Construction of Public Libraries
Higher Education Academic Facilities - State Comprehensive Planning
Higher Education Academic Facilities Construction - Interest Subsidization
Higher Education Academic Facilities Construction - Public and Private Colleges and Universities
Higher Education Academic Facilities Construction - Public Community Colleges and Technical Institutes
School Assistance in Federally Affected Areas - Construction
Supplementary Education Centers and Services (Construction Only)
Vocational Education - Basic Grants to States (Construction Only)
Juvenile Delinquency Planning, Prevention, and Rehabilitation (Planning and Construction Only)
Mental Retardation Community Facilities Construction
Vocational Rehabilitation Services - Basic Support (Construction Only)

Department of Housing and Urban Development

College Housing Debt Service
College Housing Direct Loans
Interest Subsidy - Homes for Lower Income Families
Interest Reduction Payments - Rental and Cooperative Housing for Lower Income Families
Mortgage Insurance - Construction or Rehabilitation of Condominium Projects
Mortgage Insurance - Development of Sales Type Cooperative Projects
Mortgage Insurance - Homes
Mortgage Insurance - Homes for Certified Veterans
Mortgage Insurance - Homes for Disaster Victims
Mortgage Insurance - Homes for Low and Moderate Income Families
Mortgage Insurance - Homes in Outlying Areas
Mortgage Insurance - Homes in Urban Renewal Areas
Mortgage Insurance - Investor Sponsored Cooperative Housing
Mortgage Insurance - Land Mobile Home Courts
Mortgage Insurance - Rental Housing
Mortgage Insurance - Rental Housing for Low and Moderate Income Families
Mortgage Insurance - Rental Housing for Low and Moderate Income Families Below Market Interest Rate
Mortgage Insurance - Rental Housing for Low and Moderate Income Families, Market Interest Rate
Mortgage Insurance - Rental Housing for the Elderly
Mortgage Insurance - Rental Housing in Urban Renewal Areas

Public Housing - Acquisition, Construction, Rehabilitation (New Construction Only)
Rent Supplements - Rental Housing for Low Income Families
Basic Water and Sewer Facilities - Grants
Comprehensive Planning Assistance
Historic Preservation Grants
New Communities - Loan Guarantees
New Communities - Supplementary Grants
Open Space Land Acquisition and Development Grants
Public Facility Loans
Urban Systems Engineering Demonstration Grants
Model Cities Supplementary Grants
Community Renewal Planning Grants
Neighborhood Development
Urban Renewal Projects

Department of the Interior

Outdoor Recreation - Financial Assistance
Outdoor Recreation Planning - Financial Assistance
Irrigation and Drainage Systems Loans
Small Reclamation Projects
Historic Preservation

Department of Justice

Law Enforcement Assistance - Comprehensive Planning
Law Enforcement Assistance - Discretionary Grants
Law Enforcement Assistance - Improving and Strengthening Law Enforcement

Department of Labor

Cooperative Area Manpower Planning System

Department of Transportation

Airport Development Aid Program
Forest Highways
Highway Beautification - Landscaping and Scenic Enhancement
Highway Planning and Construction
Highway Planning and Research Studies
Public Lands Highways
Traffic Operations Program to Increase Capacity and Safety (Construction Only)
Urban Mass Transportation Capital Improvement Grants (Planning and Construction Only)
Urban Mass Transportation Capital Improvement Loans (Planning and Construction Only)
Urban Mass Transportation Technical Studies Grants (Planning and Construction Only)

National Science Foundation

Intergovernmental Science Programs

Office of Economic Opportunity

Community Action Operations (Excluding Administration, Research, Training and Technical Assistance and Evaluation)

Water Resources Council

Water Resources Planning

APPENDIX A

DISTRIBUTION OF 1975, 1980, AND 1985 GENERAL AVIATION DEMAND TO BAY AREA AIRPORTS

GENERAL AVIATION ALLOCATION*

In response to the Committee's request, this estimate of how the 1975, 1980, and 1985 projected general aviation demand might be distributed to the airports in the Bay Area has been made.

In making these estimates, the following has been assumed:

1. SFO will have a limited number of general aviation aircraft based there and only about 30,000 annual g/a operations.

2. Oakland North Airport will have g/a activity, with the exception of certain business jet departures for noise abatement purposes.

3. Allowing for itinerant operations, a based aircraft would represent 800 annual operations in 1975, 900 in 1980, and 1,000 in 1985.

4. All of the privately owned airports are available through 1975; after that, only those in the rural areas will remain available.

5. The general aviation ownership was revised downward based on the new Dept. of Finance population projections.

6. As airline activity increases at SJC, general aviation traffic will decrease and in later time periods so will based aircraft.

The details of the ownership/airport allocation are shown in Tables I through 3 (1975, 1980, and 1985), and the process of estimating traffic activity and redistributing traffic is shown in Tables 4 through 6 (1975, 1980, and 1985).

Using this process, the following have been identified:

Key Existing General Aviation Airports

These represent vital existing publicly owned airports within the urbanized core:

Oakland North	Reid-Hillview
Hayward	SJC (until 1980)
Buchanan Field	Napa County
Livermore	Palo Alto
San Carlos	Half Moon Bay
Gnoss Field	

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* Prepared for the Regional Airport Systems Study Committee April 26, 1972

These airports will need to serve 500 or more based aircraft each and, constrained by runway capacity, most will need to divert their training activity to outlying airports beginning in 1975.

Private Airports

When urbanization occurs, privately owned airports are generally unable to generate sufficient revenues from the large land areas that are required to be profitable. It is suggested that the following privately owned airports will be affected:

now until 1975: all private airports remain available

1975 to 1980: the following airports will probably be phased out unless public agencies take action:

Petaluma Sky Ranch
Fremont Sky Sailing
Fremont Airport
Antioch
Vacaville
Morgan Hill
Smith Ranch

1980 to 1985: Sonoma Skypark

To accommodate the based aircraft requirements projected for the Region, the following new publicly owned general aviation airports will need to be developed:

	now until 1975			1975 to 1980			1980 to 1985			Total		
County	no.	based a/c	total op's	no.	based a/c	total op's	no.	based a/c	total op's	no.	based a/c	total op's
Alameda				1	250	300				1	250	300
Contra Costa				1	170	200	1	120	200	2	490	400
Marin												
Napa							1	20	70	1	20	70
San Francisco												
San Mateo				1	100	200				1	100	200
Santa Clara	1*	460	400	1	500	400	2	950	900	4	1910	1700
Solano							1	60	150	1	60	150
Sonoma				1	140	200				1	140	200
TOTAL	1	460	400	5	1160	1300	5	1150	1320	11	2970	3020

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* South County Airport, which is presently under construction

Additional Runway Capacity Required

Besides new airports to accommodate based aircraft, the following runway capacity will be required to provide for training flight operations diverted from the key Bay Area airports:

Airports Outside the Region	1975 Diverted Flights (000)	1980 Diverted Flights (000)	1985 Diverted Flights (000)
Hollister	5	20	100
Watsonville	5	20	50
Salinas	0	10	50
Tracy	5	20	100
TOTAL	15	70	300

"Reliever" Training Runways in the Region

Three of this type of airport will be required by 1985. Each would have a high proportion (say 80%) of "touch and go" type operations and would need an annual capacity of 100,000 to 200,000 operations.

Summary

Despite its original constraint, the projected general aviation demand will place a heavy load upon the existing publicly owned, general aviation airports.

We will need to salvage or replace with publicly owned airports some key privately owned general aviation airports.

There is today, and will increasingly be, a very substantial interdependence of general aviation airports upon each other with respect to capacity for based aircraft and runway operations.

This interdependence suggests the need for joint actions among public agencies in order to finance general aviation facilities.

The need for separated airspace between general aviation and civilian airports requires funding support from the major airline airports to provide reliever general aviation airports as envisioned by the ADAP.

Substantial use will be made of some airports outside the Region.

ALLOCATION OF GENERAL AVIATION AIRCRAFT TO AIRPORTS 1975

AIRPORTS	Alameda	Contra Costa	Marin	Napa	San Francisco	San Mateo	Santa Clara	Solano	Sonoma	AIRCRAFT LOCATION TOTAL
	OWNER LOCATION									
Alameda										
Livermore	190	50	0	0	0	0	30	0	0	270
Hayward	330	0	0	0	55	40	10	0	0	435
Fremont*	30	0	0	0	0	15	25	0	0	70
Sky Sailing*	20	0	0	0	0	15	25	0	0	60
Oakland(North)	320	50	0	0	100	70	0	0	0	480
Totals	890	100			155	80	90	0	0	1315
Contra Costa										
Antioch*	0	75	0	0	0	0	0	20	0	95
Buchanan	40	375	0	10	15	0	0	20	0	460
Totals	40	450	0	10	15	0	0	40	0	555
Marin										
Gnoss	0	0	150	0	15	0	0	0	20	185
Smith Ranch*	0	0	35	0	15	0	0	0	0	50
Totals	0	0	185	0	30	0	0	0	20	235
Napa										
Angwin*	0	0	0	15	0	0	0	0	0	15
Calistoga	0	0	0	15	0	0	0	0	0	15
Napa	0	25	25	75	5	0	0	10	20	160
Usibelli*	0	0	0	5	0	0	0	0	0	5
Totals	0	25	25	110	5	0	0	10	20	195
San Francisco	0	0	0	0	0	0	0	0	0	0
San Mateo										
Half Moon	0	0	0	0	10	190	20	0	0	220
San Carlos	0	0	0	0	60	290	30	0	0	380
San Francisco	0	0	0	0	20	20	0	0	0	40
Totals	0	0	0	0	90	500	50	0	0	640
Santa Clara										
Palo Alto	10	0	0	0	15	100	350	0	0	475
Reid-Hillview	10	0	0	0	0	25	500	0	0	535
San Jose Mun.	10	0	0	0	0	15	550	0	0	575
South County	0	0	0	0	0	0	460	0	0	460
Morgan Hill*	0	0	0	0	0	0	100	0	0	100
Totals	30	0	0	0	15	140	1960	0	0	2145

* Privately owned airport

** Privately owned with evidence that it might be closed

Chart 1

OWNER LOCATION

ALLOCATION OF GENERAL AVIATION AIRCRAFT TO AIRPORTS 1975 AIRPORTS	Alameda	Contra Costa	Marin	Napa	San Francisco	San Mateo	Santa Clara	Solano	Sonoma	AIRCRAFT LOCATION TOTAL
Solano										
Nut Tree	0	0	0	0	0	0	0	40	0	40
Rio Vista	0	25	0	0	0	0	0	30	0	55
Vaca-Dixon*	0	0	0	0	0	0	0	5	0	5
Vacaville**	0	0	0	5	0	0	0	45	0	50
Maine Prairie*	0	0	0	0	0	0	0	10	0	10
Tremont	-----------inactive 1972-----------									--
Totals	0	25	0	5	0	0	0	130	0	160
Sonoma										
Sonoma County	0	0	0	10	0	0	0	0	140	150
Cloverdale	0	0	0	0	0	0	0	0	25	25
Healdsburg	0	0	0	0	0	0	0	0	25	25
Petaluma**	0	0	10	10	10	0	0	0	30	60
Santa Rosa Air C.	0	0	10	5	0	0	0	0	80	95
Coddingtown*	-----------closed 1972--------------									--
Sonoma Valley*	0	0	10	5	10	0	0	0	15	40
Sonoma Sky Park*	0	0	10	5	10	0	0	0	15	30
Sea Ranch*	0	0	0	0	0	0	0	0	10	10
Totals	0	0	40	35	20	0	0	0	340	435
Owner Location Totals	960	600	250	160	330	720	2100	180	380	5,680

* Privately owned airport

** Privately owned with evidence that it might be closed

Chart 1 (continued)

OWNER LOCATION

ALLOCATION OF GENERAL AVIATION AIRCRAFT TO AIRPORTS 1980

AIRPORTS	Alameda	Contra Costa	Marin	Napa	San Francisco	S. Mateo	S. Clara	Solano	Sonoma	AIRCRAFT LOCATION TOTAL
ALAMEDA										
Livermore	250	80	0	0	0	0	40	0	0	370
Hayward	380	0	0	0	60	50	20	0	0	510
Oakland	390	60	0	0	150	20	10	0	0	630
New airport	100	0	0	0	0	50	100	0	0	250
sub total	1120	140	0	0	210	120	170	0	0	1760
CONTRA COSTA										
Buchanan	50	480	0	10	20	0	0	20	0	580
New airport	0	150	0	0	0	0	0	20	0	170
sub total	50	630	0	10	20	0	0	40	0	750
MARIN										
Gnoss	0	0	300	10	20	0	0	0	10	340
sub total	0	0	300	10	20	0	0	0	10	340
NAPA										
Angwin	0	0	0	20	0	0	0	0	0	20
Calistoga	0	0	0	20	0	0	0	0	0	20
Napa	0	30	30	120	10	0	0	20	20	230
Usibelli	0	0	0	10	0	0	0	0	0	10
sub total	0	30	30	170	10	0	0	20	20	280
SAN FRANCISCO	0		0	0	0	0	0	0	0	0
SAN MATEO										
Half Moon	0	0	0	0	10	200	30	0	0	240
San Carlos	0	0	0	0	70	300	50	0	0	420
San Francisco	0	0	0	0	10	30	0	0	0	40
1980 new airport	0	0	0	0	10	90	0	0	0	100
sub total	0	0	0	0	100	620	80	0	0	800

Chart 2

OWNER LOCATION

ALLOCATION OF GENERAL AVIATION AIRCRAFT TO AIRPORTS 1980 AIRPORTS	Alameda	Contra Costa	Marin	Napa	San Francisco	S. Mateo	S. Clara	Solano	Sonoma	AIRCRAFT LOCATION TOTAL
SANTA CLARA										
Palo Alto	10	0	0	0	0	150	450	0	0	610
Reid-Hillview	10	0	0	0	0	30	660	0	0	700
San Jose	10	0	0	0	0	20	500	0	0	530
South County	0	0	0	0	0	0	600	0	0	600
	0	0	0	0	0	0	500	0	0	500
sub total	30	0	0	0	0	200	2710	0	0	2940
SOLANO										
Nut Tree	0	0	0	10	0	0	0	90	0	100
Rio Vista	0	0	0	0	0	0	0	60	0	60
Vaca-Dixon	0	0	0	0	0	0	0	10	0	10
Maine-Praire	0	0	0	0	0	0	0	10	0	10
Sub total	0	0	0	10	0	0	0	170	0	180
SONOMA										
Sonoma Co.	0	0	0	0	0	0	0	0	280	280
Cloverdale	0	0	0	0	0	0	0	0	30	30
Healdsburg	0	0	0	0	0	0	0	0	40	40
Sonoma Valley	0	0	0	10	0	0	0	0	20	30
Sea Ranch	0	0	0	0	0	0	0	0	20	20
New airport	-	-	10	10	20	0	0	0	100	140
sub total	0	0	10	20	20	0	0	0	490	540
Owner Location Totals	1200	800	340	220	380	940	2960	230	520	7590

OWNER LOCATION

ALLOCATION OF GENERAL AVIATION AIRCRAFT TO AIRPORTS 1985 — AIRPORTS	Alameda	Contra Costa	Marin	Napa	San Francisco	San Mateo	Santa Clara	Solano	Sonoma	AIRCRAFT LOCATION TOTAL
ALAMEDA										
Livermore	310	110	0	0	0	0	100	0	0	520
Hayward	430	10	0	0	70	60	20	0	0	590
Oakland	430	80	0	0	150	30	0	0	0	690
1980 airport	150	10	0	0	0	70	400	0	0	630
sub total	1320	210	0	0	220	160	520	0	0	2430
CONTRA COSTA										
Buchanan	70	500	0	10	20	0	0	10	0	610
1980 airport	10	200	0	0	0	0	0	20	0	230
new airport	10	100	0	0	0	0	0	10	0	120
sub total	90	800	0	10	20	0	0	40	0	960
MARIN										
Gnoss	0	0	390	0	20	0	0	0	10	420
sub total	0	0	390	0	20	0	0	0	10	420
NAPA										
Angwin	0	0	0	20	0	0	0	0	0	20
Calistoga	0	0	0	20	0	0	0	0	0	20
Napa	0	40	40	200	0	0	0	40	30	350
Usibelli	0	0	0	10	0	0	0	0	0	10
new airport	0	0	0	0	0	0	0	0	20	20
sub total	0	40	40	250	0	0	0	40	50	420
SAN FRANCISCO	0	0	0	0	0	0	0	0	0	0
SAN MATEO										
Half Moon	0	0	0	0	30	280	40	0	0	350
San Carlos	0	0	0	0	60	350	70	0	0	480
SFO	0	0	0	0	10	30	0	0	0	40
new airport	0	0	0	0	30	100	50	0	0	180
sub total	0	0	0	0	130	760	160	0	0	1050

Chart 3

OWNER LOCATION

ALLOCATION OF GENERAL AVIA..ON AIRCRAFT TO AIRPORTS 1985

AIRPORTS	Alameda	Contra Costa	Marin	Napa	San Francisco	San Mateo	Santa Clara	Solano	Sonoma	AIRCRAFT LOCATION TOTAL
SANTA CLARA										
Palo Alto	20	0	0	0	0	160	500	0	0	680
Ried-Hill	20	0	0	0	0	30	500	0	0	550
San Jose	0	0	0	0	0	10	300	0	0	310
So. County	0	0	0	0	0	0	600	0	0	600
1980 airport	10	0	0	0	0	20	500	0	0	530
new airport	0	0	0	0	0	30	500	0	0	530
new airport	0	0	0	0	0	0	420	0	0	420
sub total	50	0	0	0	0	250	3320	0	0	3620
SOLANO										
Nut Tree	0	0	0	0	0	0	0	100	0	100
Rio Vista	0	0	0	0	0	0	0	70	0	70
Vaca Dixon	0	0	0	0	0	0	0	10	0	10
Maine Praire	0	0	0	0	0	0	0	10	0	10
new airport	0	0	0	10	0	0	0	50	0	60
sub total	0	0	0	10	0	0	0	240	0	250
SONOMA										
Sonoma Co.	0	0	0	10	0	0	0	0	330	340
Cloverdale	0	0	0	0	0	0	0	0	40	40
He-!dsburg	0	0	0	0	0	0	0	0	50	50
Sonoma Val.	0	0	0	10	0	0	0	0	40	50
Sea Ranch	0	0	0	0	0	0	0	0	20	20
1980 airport	0	0	10	10	30	0	0	0	160	210
sub total	0	0	10	30	30	0	0	0	640	710
Owner Location Total	1460	1050	440	300	420	1170	4000	320	700	9860

1975 AIRPORTS BY COUNTY	Based Aircraft Present 1968	Based Aircraft Staff Allocation Co. Residents	Based Aircraft Staff Allocation Others	Based Aircraft Staff Allocation Total	Estimated Annual Traffic (000) 1968	Estimated Annual Traffic (000) Staff Allocation Based (800/a/c)	Estimated Annual Traffic (000) Staff Allocation Training Diversion	Estimated Annual Traffic (000) Staff Allocation Total	Annual Capacity (000) Exist. Runway (1970)	Annual Capacity (000) Future Planned Runways	Additional Airport Capacity Required: Expand or overload Existing Airport by	Additional Airport Capacity Required: New Airport 1975	Comments
ALAMEDA													
Livermore	187	190	80	270	270	220	40	260	236	301			
Hayward	406	330	105	435	284	350	10	360	363	363			
Fremont	80	30	40	70	35	56	4	60	168	168			
Sky Sailing	17	20	40	60	70	48	2	50	93	93			
Oakland(North)	487	320	160	480	300	390	60	450	546	546			
sub total	1177	890	425	1315	959	1064	1161	1180	1406	1471			
CONTRA COSTA													
Antioch	60	75	20	95	30	76	14	90	184	184			
Buchanan	386	375	85	460	347	360	(40)	320	324	340			
sub total	446	450	105	555	377	436	(26)	410	508	524			
MARIN													
Gnoss	96	150	35	185	100	150	10	160	190	190			
Smith Ranch	37	35	15	50	15	40	1	40	190	190			
sub total	133	185	50	235	115	190	10	200	380	380			
NAPA													
Angwin	30	15	0	15	20	12	3	15	126	126			
Calistoga	15	15	0	15	10	12	3	15	168	168			
Napa	130	75	85	160	179	130	100	230	258	426*			
Usibelli	2	5	0	5	6	4	6	10	168	168			
sub total	177	110	85	195	215	158	112	270	720	888			
SAN FRANCISCO													
	0	-	0	0	0	0	0	0	0	0			
SAN MATEO													
Half Moon	35	190	30	220	40	180	40	220	184	184	36		
San Carlos	384	290	90	380	300	310	(60)	250	268	375			
San Francisco	75	20	20	40	58	32	(5)	27	40	40			
sub total	494	500	140	640	398	522	(25)	497	492	599			

Chart 4

A-10

*Napa County Airport Master Plan. March, 1970 Stage IV capacity of 430,000 annual operations, less Case I airline operations of 4,000.

1975 AIRPORTS BY COUNTY	Based Aircraft: Present (1968)	Based Aircraft: Staff Allocation: Co. Residents	Based Aircraft: Staff Allocation: Others	Based Aircraft: Staff Allocation: Total	Estimated Annual Traffic (000): Present 1968	Estimated Annual Traffic (000): Staff Allocation: Based (800/a/c)	Estimated Annual Traffic (000): Staff Allocation: Training Diversion	Estimated Annual Traffic (000): Staff Allocation: Total	Annual Capacity (000): Exist. Runway (1970)	Annual Capacity (000): Future Planned Runways	Additional Airport Capacity Required: Expand or overload Existing Airport by	Additional Airport Capacity Required: New Airport 1975	Comments
SANTA CLARA													
Palo Alto	285	350	125	475	210	380	(40)	340	239	375			
Reid-Hillview	420	500	35	535	221	430	(150)	280	251	339			
San Jose	503	550	25	575	389	310	(30)	280	400	400			
South Co.	**	460	0	460	**	370	30	400	-	400			
Morgan Hill	35	100	0	100	5	80	20	100	190	190			
sub total	1243	1960	185	2145	825	1570	(170)	1400	1080	1704			
SOLANO													
Nut Tree	28	40	0	40	42	30	20	50	190	190			
Rio Vista	16	30	25	55	11	44	26	70	250	250			
Vaca-Dixon	9	5	0	5	5	4	9	5	171	171			
Vacaville	35	45	5	50	20	40	0	40	168	168			
Maine Prairie	8	10	0	10	4	8	2	10	152	152			
sub total	96	130	30	160	82	126	49	175	931	931			
SONOMA													
Sonoma Co.	187	140	10	150	96	120	50	170	226	226			
Cloverdale	11	25	0	25	12	20	5	25	222	222			
Healdsburg	22	25	0	25	15	20	10	30	222	222			
Petaluma	71	30	30	60	18	50	10	60	250	250			
Air Center	41	80	15	95	24	80	20	100	190	190			
Sonoma Valley	30	15	25	40	30	30	10	40	171	171			
Skypark	31	15	15	30	30	24	6	30	152	152			
Sea Ranch	3	10	0	10	4	8	2	10	168	168			
sub total	396	340	95	435	229	352	113	465	1601	1601			
GRAND TOTALS	4162	4565	1115	5680	3200	4418	179	4597	7118	8098	36		

**Under construction at present time

Chart 4 (continued)

1980 AIRPORTS BY COUNTY	Based Aircraft				Estimated Annual Traffic (000)				Annual Capacity (000)		Additional Airport Capacity Required		
	1975	Staff Allocation: Co. Residents	Staff Allocation: Others	Staff Allocation: Total	1975	Staff Allocation: Based (900 a/c)	Staff Allocation: Training Diversion	Staff Allocation: Total	Exist. Runway (1970)	Future Planned Runways	Expand or overload Existing Airport by	New Airport 1980	Comments
ALAMEDA													
Livermore	270	250	120	370	243	330	0	330	236	301	30	-	
Hayward	435	380	130	510	392	460	(60)	400	363	363	40	-	
Oakland	480	390	240	630	432	570	0	570	546	546	20	-	
1980 new airport	-	100	150	250	-	230	70	300	-	-	-	300	This VFR airport would replace the private airports in the Fremont area
sub total	1185	1120	640	1760	1067	1590	10	1600	1145	1210	90	300	
CONTRA COSTA													
Buchanan	460	480	100	580	414	520	(120)	400	324	340	60	-	
1980 new airport	-	150	20	170	-	150	50	200	-	-	-	200	
sub total	460	630	120	750	414	670	(70)	600	324	340	60	200	
MARIN													
Gnoss	185	300	40	340	167	310	(10)	300	190	190	110	-	
sub total	185	300	40	340	167	310	(10)	300	190	190	110	-	
NAPA													
Angwin	15	20	0	20	14	18	2	20	126	126	-	-	
Calistoga	15	20	0	20	14	18	2	20	168	168	-	-	
Napa	160	120	110	230	144	210	190	400	258	426	-	-	
Usibelli	5	10	0	10	5	9	11	20	168	168	-	-	
sub total	195	170	110	280	177	255	205	460	720	888	0	0	
SAN FRANCISCO	0	0	0	0	0	0	0	0	0	0	0	0	
SAN MATEO													
Half Moon	220	200	40	240	198	216	30	246	184	184	62	-	
San Carlos	380	300	120	420	342	378	(45)	333	268	375	-	-	
San Francisco	40	30	10	40	36	36	(5)	31	40	40	-	-	
1980 new airport	-	90	10	100	-	90	110	200	-	-	-	200	
sub total	640	620	180	800	576	720	90	810	492	599	62	200	

Chart 5

1980 AIRPORTS BY COUNTY	Based Aircraft 1975	Based Aircraft Staff Allocation: Co. Residents	Others	Total	Estimated Annual Traffic (000) 1975	Staff Allocation: Based (900 a/c)	Training Diversion	Total	Annual Capacity (000): Exist. Runway (1970)	Future Planned Runways	Additional Airport Capacity Required: Expand or overload Existing Airport by	New Airport 1980	Comments
SANTA CLARA													
Palo Alto	475	450	160	610	428	550	(150)	400	239	375	25	-	
Reid-Hillview	535	660	40	700	482	630	(230)	400	251	339	61	-	
San Jose	575	500	30	530	518	480	(80)	400	400	400	-	-	
South Co.	460	600	0	600	414	540	(140)	400	-	400	-	-	
1980 new airport	-	500	0	500	-	450	(50)	400	-	-	-	400	
sub total	2045	2710	230	2940	1842	2650	(650)	2000	890	1514	86	400	
SOLANO													
Nut Tree	40	90	10	100	36	90	60	150	190	190	-	-	
Rio Vista	55	60	0	60	50	54	56	110	250	250	-	-	
Vaca-Dixon	5	10	0	10	4	9	1	10	171	171	-	-	
Maine Prairie	10	10	0	10	9	9	1	10	152	152	-	-	
sub total	110	170	10	180	99	162	118	280	763	763	0	0	
SONOMA													
Sonoma	150	280	0	280	135	250	50	300	226	226	75	-	
Cloverdale	25	30	0	30	23	27	3	30	222	222	-	-	
Healdsburg	25	40	0	40	23	36	64	100	222	222	-	-	
Sonoma Valley	40	20	10	30	36	27	3	30	171	171	-	-	
Sea Ranch	10	20	0	20	9	18	2	20	168	168	-	-	
1980 new airport	-	100	40	140	-	126	74	200	-	-	-	200	
sub total	250	490	50	540	226	484	196	680	1009	1009	75	200	
GRAND TOTAL	5070	6210	1380	7590	4568	6841	(111)	6730	5533	6513	483	1300	

Chart 5 (continued)

Chart 6

1985 AIRPORTS BY COUNTY	Based Aircraft 1980	Based Aircraft Staff Allocation Co. Residents	Based Aircraft Staff Allocation Others	Based Aircraft Staff Allocation Total	Estimated Annual Traffic (000) 1980	Estimated Annual Traffic (000) Staff Allocation Based (1000a/c)	Estimated Annual Traffic (000) Staff Allocation Training Diversion	Estimated Annual Traffic (000) Staff Allocation Total	Annual Capacity (000) Exist. Runway (1970)	Annual Capacity (000) Future Planned Runways	Additional Airport Capacity Required: Expand or overload Existing Airport by	Additional Airport Capacity Required: New Airport 1985	Comments
ALAMEDA													
Livermore	370	310	210	520	330	520	(170)	350	236	301	49		
Hayward	510	430	160	590	400	590	(180)	410	363	363	47		
Oakland	630	430	260	690	570	690	(100)	590	546	546	44		
1980 airport	250	150	480	630	300	630	(280)	350	-	300	50		
sub total	1760	1320	1110	2430	1600	2430	(730)	1700	1145	1510	190		
CONTRA COSTA													
Buchanan	580	500	110	610	400	610	(210)	400	324	340	60		
1980 airport	170	200	30	230	200	230	100	330	-	200	130		
1985 new airport	-	100	20	120	-	120	80	200	-	-	-	200	
sub total	750	800	160	960	600	960	(30)	930	324	540	190	200	
MARIN													
Gnoss	340	390	30	420	300	420	(70)	350	190	190	160		
sub total	340	390	30	420	300	420	(70)	350	190	190	160		
NAPA													
Angwin	20	20	0	20	20	20	5	25	126	126			
Calistoga	20	20	0	20	20	20	5	25	168	168			
Napa	230	200	150	350	400	350	100	450	258	426	24		
Usibelli	10	10	0	10	20	10	5	15	168	168			
1985 new airport	-	0	20	20	-	20	50	70	-	-		150	
sub total	280	250	170	420	460	420	165	585	720	888	24	150	
SAN FRANCISCO	0	0	0	0	0	0	0	0	0	0	0	0	
SAN MATEO													
Half Moon	240	280	70	350	246	350	100	450	184	184	266		
San Carlos	420	350	130	480	333	480	(80)	400	268	375	25		
San Francisco	40	30	10	40	31	40	(5)	35	40	40	-		
1980 new airport	100	100	80	180	200	180	120	300	-	300	-		
sub total	800	760	290	1050	810	1050	135	1185	492	899	291		

1985 AIRPORTS BY COUNTY	Based Aircraft 1980	Staff Allocation Co. Residents	Others	Total	Estimated Annual Traffic (000) 1980	Staff Allocation Based (1000a/c)	Training Diversion	Total	Annual Capacity (000) Exist. Runway (1970)	Future Planned Runways	Additional Airport Capacity Required Expand or overload Existing Airport by	New Airport 1985	Comments
SANTA CLARA													
Palo Alto	610	500	180	680	400	680	(255)	425	239	375	50		
Reid-Hill.	700	500	50	550	400	550	(150)	400	251	339	60		
San Jose	530	300	10	310	400	310	(50)	260	400	400	-		
South Co.	600	600	0	600	400	600	(150)	450	-	400	50		
1980 new airport	500	500	30	530	400	530	(80)	450	-	400	50		
1985 newa/p	-	500	30	530	-	530	(80)	450	-	-	50	400	
1985 new a/p	-	420	0	420	-	420	30	450	-	-	50	400	
sub total	2940	3320	300	3620	2000	3620	(735)	2885	890	1914	310	800	
SOLANO													
Nut tree	100	100	0	100	150	100	100	200	190	190	10		
Rio Vista	60	70	0	70	110	70	180	250	250	250	-		
Vaca-Dixon	10	10	0	10	10	10	5	15	171	171	-		
Maine Pra.	10	10	0	10	10	10	5	15	152	152	-		
1985 new a/p	-	50	10	60	-	60	90	150	-	-	-	150	
sub total	180	240	10	250	280	250	380	630	763	763	10	150	
SONOMA													
Son. Co.	280	330	10	340	300	340	(40)	300	226	226	75		
Cloverdale	30	40	0	40	30	40	5	45	222	222	-		
Healdsburg	40	50	0	50	100	50	70	120	222	222	-		
Son. Valley	30	40	10	50	30	50	20	70	171	171	-		
Sea Ranch	20	20	0	20	20	20	0	20	168	168	-		
1980 new airport	140	160	50	210	200	210	190	400	-	200	200		
sub total	540	640	70	710	680	710	245	955	1009	1209	275		
GRAND TOTAL	7590	7720	2140	9860	6730	9860	(640)	9220	5533	7913	1450	1300	

Chart 6 (continued)

APPENDIX B

FORECASTS

ESTIMATE OF TOTAL COMMERCIAL AIRCRAFT MOVEMENTS IN THE SAN FRANCISCO BAY AREA

	Airport	Allocated Passengers (MAP)	Avg. Passengers/ Flight Operation*	Annual Commercial Operations (000)
1975	SFO	19	70	270
	OAK	6	65	93
	SJC	3	65	46
	TRA	-	-	-
	HAM/NAP	-	-	-
	TOTAL	28		409
1980	SFO	23	85	270
	OAK	13	85	153
	SJC	6	80	75
	TRA	1	80	13
	HAM/NAP	1	80	13
	TOTAL	44		524
1985	SFO	31	100	310
	OAK	24	100	240
	SJC	10	95	105
	TRA	6	95	63
	HAM/NAP	1	95	11
	TOTAL	72		729

* The average passengers per flight operation includes all-cargo and positioning flights. The lower figure for each year is for those airports with no 747 type aircraft. The seat factor from which these figures are computed is: 1975: 45%; 1980: 53%; 1985: 60%.

FORECASTING EQUATIONS

The equation for projecting passenger traffic is as follows:

$$T_z = P_z A_j \left(3.8915 \frac{E_z}{P_z} + 1.5439 \frac{Y_z}{P_z} - 469.966\right)$$

Where:

T_z = annual enplaned and deplaned passenger traffic, in thousands, generated in the zone

P_z = resident population of the zone in hundred thousands

A_j = adjustment factors 1975 = .884
1980 = .901
1985 = .969

E_z = number of people working in the zone, in thousands

Y_z = total annual personal income of residents of the zone, in millions

By 1975, connecting traffic is estimated to be <u>15% of total traffic</u>. This connecting traffic is not computed in the above formula, and must therefore be included in the calculation of the total product.

The equation for projecting air cargo traffic is as follows:

Enplaned Cargo:

$$\text{Log} \frac{T_1}{E} = 1.61754 \log Y - 1.3953 \log R + 1.9559$$

Deplaned Cargo:

$$\text{Log} \frac{T_2}{E} = 1.6994 \log Y - 1.6746 \log R + 2.1484$$

Where:

T = Total annual volume of cargo enplanement or deplanement in millions of pounds

E = Total employment in millions

Y = Total annual personal income of all residents in billions of current dollars

R = Average cargo revenue yield for all U.S. route certificated carriers in current cents per revenue ton mile :
1975 = 16.8; 1980 = 15.2; 1985 = 14.5

PASSENGER FORECASTS

	County	Population (hundred thousands)	Employment (thousands)	Income (millions of dollars)	Annual Passengers including 15% connecting (thousands)
1975	Alameda	11.29	463	5,770	5,620
	Contra Costa	6.14	159	3,000	2,460
	Marin	2.27	62	1,460	1,490
	Napa	.88	36	406	370
	San Francisco	6.98	508	5,009	6,690
	San Mateo	5.82	233	3,710	4,050
	Santa Clara	12.16	476	6,300	6,100
	Solano	1.72	61	770	640
	Sonoma	2.35	76	1,000	760
	TOTAL	49.61	2,074	27,425	28,180
1980	Alameda	12.06	505	7,840	8,910
	Contra Costa	6.86	177	4,380	4,480
	Marin	2.59	64	2,190	2,550
	Napa	1.03	43	592	630
	San Francisco	7.08	520	6,330	8,980
	San Mateo	6.13	252	5,180	6,460
	Santa Clara	13.84	525	9,100	10,160
	Solano	1.99	68	1,100	1,090
	Sonoma	2.75	90	1,445	1,370
	TOTAL	54.33	2,244	38,157	44,640
1985	Alameda	12.89	547	10,430	13,900
	Contra Costa	7.72	196	6,528	8,240
	Marin	2.96	74	3,338	4,620
	Napa	1.24	50	872	1,090
	San Francisco	7.14	568	7,906	12,600
	San Mateo	6.45	260	7,173	10,300
	Santa Clara	15.72	595	13,137	17,400
	Solano	2.39	83	1,647	1,980
	Sonoma	3.20	100	2,096	2,420
	TOTAL	59.71	2,473	53,127	72,550

Population figures are from the California Department of Finance projections. Per capita income and employment remain the same as the original forecast work (employment figures from BATSC and income figures projected by the contractor).

Total annual passenger figures have been rounded off to an appropriate precision level.

REGIONAL CARGO FORECASTS

	Employment (millions)	Income (billions of dollars)	Annual Enplaned Cargo (millions lbs)	Annual Deplaned Cargo (millions lbs)	Total Annual Cargo (millions lbs)
1975	2.063	27.380	742	712	1,454
1980	2.223	37.810	1,593	1,570	3,163
1985	2.473	53.127	3,300	3,390	6,690

Because of the uncertainties expressed by the contractor in the cargo projections by county, no breakdown of total cargo for the Region was calculated.

APPENDIX C

CAPITAL COST ESTIMATES

AIRLINE AIRPORT COST ESTIMATES

(millions of dollars at 1971 costs)

Public Funds Only

	Original Estimated Passengers (MAP)	Cost at Original Passenger Level	Recommended Passenger Level (MAP)	Staff Adjusted Cost
1975*				
SFO	-	-	19	90.0
OAK	8.8	16.5	6	16.5
SJC	7.5	**	3	25.0**
TOTAL				131.5
1980*				
SFO	-	-	23	120.0
OAK	13.8	34.8	13	34.8
SJC	7.5	84.1	6	65.0**
TRA	29.5	340.0	1	8.4+
NAP	2.7	16.1	1	16.1***
HAM	2.7	11.7	1	11.7***
TOTAL				239.9****
1985*				
SFO	32.7	244.7+++	32	244.7
OAK	24.1	111.2+++	24	111.2
SJC	16.5	143.1+++	10	100.0**
TRA	29.5	340.0	6	27.9++
NAP	2.7	16.1	1	16.1***
HAM	2.7	11.7	1	11.7***
TOTAL				495.5****

* Figures are cumulative from the present.

** These estimates were obtained from SJC capital program.

*** These estimates have not been revised downward since the primary work required would be little changed.

**** Totals include HAM and not NAP.

\+ Assumes joint use of the existing runway system.

\++ If a completely separate runway were required, the land and construction cost would raise this to 32 or 66, depending upon whether a close-in or wide-track runway configurations were used.

\+++ These figures do not include transit. With transit, SFO = 302.2, OAK = 162.8, and SJC = 200.6.

GENERAL AVIATION COST ESTIMATE

(millions of dollars)

by 1985

Improvements to Existing Airports:	
Buchanan Field	2.7
Gnoss Field	3.7
Hayward	3.9
Livermore	4.9
Palo Alto	1.1
San Carlos	3.9
SUBTOTAL	20.2
Under Construction:	
South County	1.5
SUBTOTAL	1.5
Replacement Airports:	
Antioch	1.3
Fremont	2.6
Petaluma	1.1
SUBTOTAL	5.0
New Airports	
Alameda (1)	3.0
Contra Costa (1)	3.0
Napa (1)	3.0
San Mateo (1)	3.0
Santa Clara (3)	9.0
Solano (1)	3.0
SUBTOTAL	21.0
GRAND TOTAL	47.7

U.C. BERKELEY LIBRARIES
C124924690